AMERICAN MACHINIST

SEPTEMBER 2, 1943

Woman's Place in War Work — Page 94

PRECISION TURNING - FACING
GROOVING ALUMINUM CYL
HEADS WITH HEALD BORE-MA

Borizing Points the Way to Post War Precision Finishing of Light Metals

ORIZED ALUMINUM
ND MAGNESIUM
IRCRAFT PARTS
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earing Housings
earing Supports
ost Control Housings
mshaft Brackets
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arburetor Main Bodies
lutch Selector Housings
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ylinders
ylinder Heads
ylinder Muffs
rankcase Assemblies
rankcase Sections
rankcase Blower Sections
rankcase Front Sections
rankcase Center Sections
rankcase Covers
rankcase Rear Covers
ntermediate Crankcases
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ower Half Crankcases
ear Crankcases
rankcase Bearing Caps
rankpin Oil Plugs
rankshaft Oil Plugs
rive Shaft Supports
ront Bearing Caps
ront Covers
uel Pump Bodies
uel Pump Drive Shafts
ear Boxes
ear Cases

What can be accomplished with light metals such as aluminum and magnesium, and indicative of what will be done with these alloys in post-war manufacturing, has already been shown by the aircraft industry. Approximately 40 per cent of the aircraft engine is comprised of light metals, and largely because of this it has been possible to reduce the horsepower-weight ratio to 1 lb. per horsepower.

Just as valuable as the aircraft industry's lesson to the post-war world on the use of light metals are the lessons to be learned from their methods and practices in machining aluminum and magnesium. Their methods of finishing parts made of these metals deserves particular attention. Study of their processes reveals the outstanding fact that *borizing*, or precision boring, turning facing, and grooving with cemented carbide or diamond tools, is used almost exclusively for precision finishing of aluminum and magnesium. The partial list of aircraft parts given herewith is eloquent testimony of this—all of them are made of either aluminum or magnesium and all of them are *borized*.

For More Precision, FASTER
bring your problems to
The HEALD MACHINE CO., Worcester, Mass.

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Gun Turret Gimbal
Gun Turret Saddle
Gyro Pilot Pump Pu
Gyro Pilot Servo Bo
Housings
Hydraulic Cylinder
Instrument End Shi
Magneto Adapters
Magneto Gear Hou
Magneto Housings
Motor End Shields
Oil Pumps
Oil Pump Bodies
Oil Pump Covers
Oil Pump Scavenge
Pistons
Plates
Pump Housings
Propeller Domes
Propeller Shaft Bea
Propeller Shaft Plug
Rear Cam Supports
Rear Reduction Gea
Reduction Drive Sup
Reduction Gear Cas
Regulator Covers
Regulator Housings
Selsyn Motor Parts
Shock Absorber Fitti
Speed Reducer Hou
Supercharger Bearin
Supercharger Front
Supercharger Gear C
Supercharger Rear C
Supercharger Rear C
Valve Brackets
Valve Housings
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Valve Tappet Guide
Volute Casings
Water Pump Casing
Wheelcases

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September 2, 1943

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AMERICAN MACHINIST —chips

Blue Chips . . . For lo these many months we have been wanting to comment on the livewire house organ published by Alfred Stauffer Machine Shops of Honey Brook, Pa. "Blue Chips" is the name of the paper, and so we feel a certain kinship.

We would like to say that the gentleman in charge of the Humor Department has quite an eye for a likely gag . . . and his column certainly lives up to the heading "A Bit of Spice." It is very tangy. We will content ourselves here by quoting from another department; a somewhat pathetic item with a whimsical windup:

"Jim Withers is progressive. He believes in looking ahead. He recently bought a steam roller and a contract to finish a piece of road. Getting in shape to do the work he fired up. An old box in the roller looked like good kindling to start the fire, so Jim threw it in the fire box. Just as he walked away the roller blew into a thousand pieces. You see, the box was full of dynamite. Now Jim hasn't any roller and he lost his road-building contract. He is continuing to operate our No. 1 boring mill."

(But not very happily, we wager!)

o

Swap Shop . . . *While on the subject of house magazines, we give you the gleanings of a recent browse through "Ohio Tool Topics." This publication is chock-full of personals concerning the Ohio Tool Company and injects a pleasant note by featuring in current issues luscious photos of a "pin-up girl of the month." Not bad, either. (For the boys in service, of course . . . you wouldn't be interested.)*

One column that caught our eye was that of the "Swap Shop" . . . and we'll pass on the following advertisements in case you are interested:

"Edna Aieken, Plant No. 3, will swap a rowing machine (reducer) to you guys and gals for an antique chair."

"Frank Fuhs, Plant No. 3, will swap a pair of $8.95, size 8½ brand new, luggage tan spectator pumps for two pairs of Nylon hose, size 10½."

"Elton Hoehn, Plant No. 1, will swap a Radiola, vintage 1930, for what have you. (This cabinet will make a swell portable bar.)"

"Bruce Collins, B/G No. 1, will swap a pint of Seagram's 5 Crown for a pint of gin."

o

Ickes Again . . . A few issues back we commented on the fact that our boredom with billions had been broken by the Secretary of the Interior, who was now talking in terms of "trillions."

That this was no one-time shot is confirmed by a recent press release of the good Secretary . . . who says that we can count on about three trillion tons of coal for making synthetic fuel or what have you.

All right, Mr. Ickes—but you're setting Washington a bad example with that "trillion" stuff.

o

Radio Nails . . . *Our nominee for the neatest term of the week is "Radio Nails," recently billed by RCA as needle-shaped shots of radio power that substitute for metal nails and staples to pin together stacked sheets of plywood.*

The radio nail, of course, is the result of intense heat generated by high-frequency, or short-wave radio. "Shot" from a small, fat-barrelled pistol, the intense heat almost instantly heats the glue in the narrow path of the beam to several hundred degrees Fahrenheit. This produces spots of glue between each sheet that hold like pins.

As a matter of perhaps academic interest to you, experiments in cooking food by radio are likewise under way.

Looking Ahead . . . The public recently was exposed to several post-war products being kept up the sleeves of these manufacturers:

Consolidated Vultee reports that William B. Stout has designed three airplanes for everyday use—all of which encroach on the field today occupied by the automobile.

Radio Corp. of America predicts that the long-awaited advent of full-scale commercial television will become a fact "within the shortest space of time required to reconvert the radio manufacturing industry from war to peace production."

We were particularly interested in these pronouncements because they lend the authority of responsible persons to several of our old and cherished dreams. Certainly we all must realize that things are changing daily, and only those who *plan* ahead will *be* ahead when the right time comes.

o

Production Plea . . . *Of course, you know that a concerted effort is being made by government, labor and management officials to erase the overconfidence which apparently has contributed to a lag in war production.*

This technical journal has long been trying to bring you every possible scrap of information to help speed up the production process. This has been done editorially and it is being done to an increasing degree in advertising pages.

We are making a special effort to get manufacturers to put in their ads all the information they can that will help you speed production. We are asking you to go through this advertising thoroughly and get out of it all that you can. We might say that by doing so, not only will you find a wealth of ideas that you can use immediately, but you will also be building up a store of useful data that will serve you in good stead when the job of reconversion to peacetime production is turned over to you.

Reprints of

"HOW TO RUN AN ENGINE LATHE"

(From July 8 issue)

NOW AVAILABLE

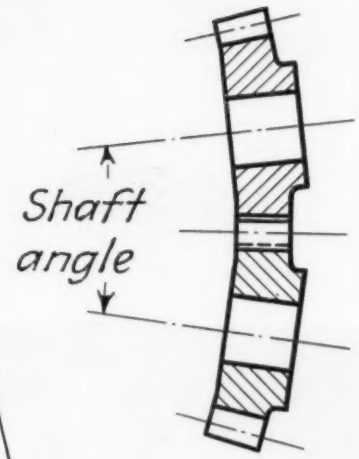
(At 10c per copy)

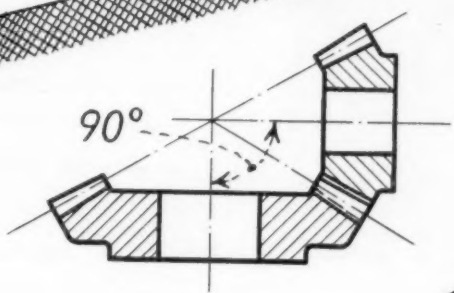
MEMO

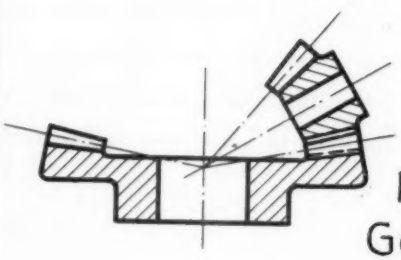
Don't Forget— Bevel Gears Operate at ANY Shaft Angle

Too often this important fact is overlooked — forgotten by designers who believe that bevels work only at right angles. **Remember**—whenever you want to transmit power or motion "around a corner"—no matter what angle—a pair of bevel gears can be made for the job. Straight, Zerol, or spiral, Gleason-cut bevels provide smooth, reliable, long-life operation.

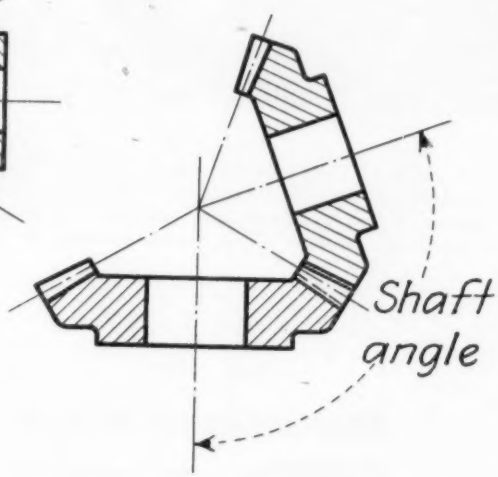
For over 75 years, the Gleason Works has been a specialist in "turning the corners." May we help you now with your angular drives?







Internal Bevel
Gear and Pinion



GLEASON

GLEASON WORKS

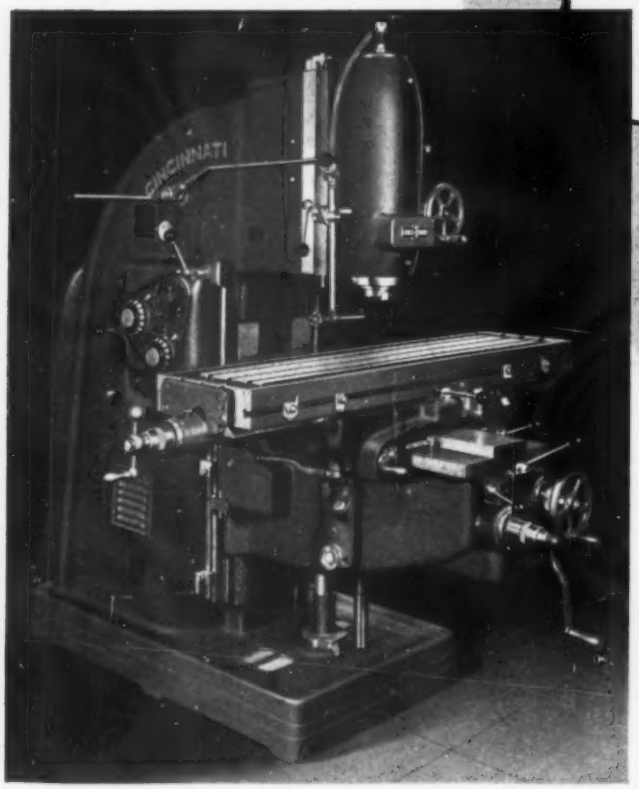
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

ARMY E NAVY

Machines that are safe and easy to operate reduce absenteeism.

CINCINNATI



The CINCINNATI No. 3 Vertical Dial Type Milling Machine. Specification catalog M-970-1 gives complete details on all features and benefits. A copy of this informative book is yours for the asking. Write today!

There's no question but what absenteeism is war effort enemy No. 1. It has been referred to as "a dangerous war cancer which cannot be ignored." ¶ A favorite excuse for staying off the job is illness caused by fatigue, and arresting this harmful practice is an individual responsibility. *You* may be able to help by putting your operators on machines that are easy to handle . . . . machines that won't tire them out and give them an excuse to stay off the job. So, why not install CINCINNATI Milling Machines? They are admittedly easy to handle and safe to operate, and your men will enjoy running them because they can be depended upon to turn out work right and with the least amount of operator effort. The engineers here at Milling Headquarters have seen to that. They'll be glad to give you all the facts.

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

THE CINCINNATI

MILLING MACHINE

Milling a fixture part on a CINCINNATI Vertical Dial Type Milling Machine, equipped with quick-change device. ¶ By moving a small lever which releases the power for shifting gears, speeds and feeds are changed without effort. This feature, exclusive with CINCINNATI Milling, is a big contribution to the reduction of operator fatigue.

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

WE

Gentlemen, he's tired. This patient and venerable creature is the most overworked piece of machinery in the world. For countless centuries the old one-horsepower hay burner was the most efficient engine we had, and he has done much of this world's work.

Today, aeronautical engineers have packed a horsepower into a few ounces

NOMINATE FOR GLORY...

of metal, and more than 2,000 horsepower into a single engine. Tolerances are measured in thousandths of an inch, and bearing smoothness is measured in millionths.

There's a reason for such precision as this. Into the cylinders of that finished engine will pour a torrent of 15-ton explosions at the rate of hundreds of blasts every second during the million miles of flight that is the life expectancy of the engine. And that, brother, is horsepower!

Today, Jones & Lamson machine tools, engineers and service men will be found on every airplane engine production line in America, helping to make possible this miracle of power. . . . They are at your service. Call upon them now.

JONES & LAMSON
MACHINE COMPANY

Manufacturers of • Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

Springfield, *Vermont,* **U. S. A.**

Official U. S. Navy Photo

WAR PRODUCTION BULLETIN

Variable Pitch Propellers

of differing operating requirements

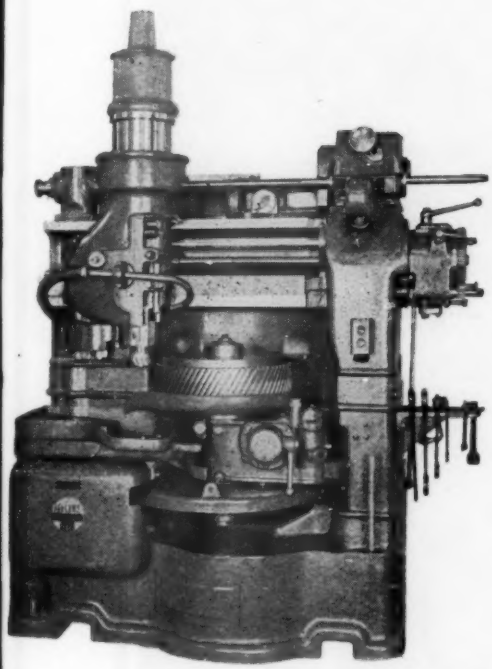
are alike in that they incorporate Gear Shaper cut parts...held to precision limits by the use of Fellows Gear Shapers and Cutters.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

UNFAILING RELIABILITY

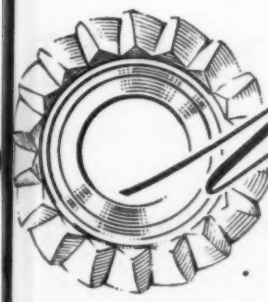
DEPENDS UPON ACCURACY...



6A-type Fellows Gear Shaper for all gear cutting purposes on parts up to 18 inches diameter.

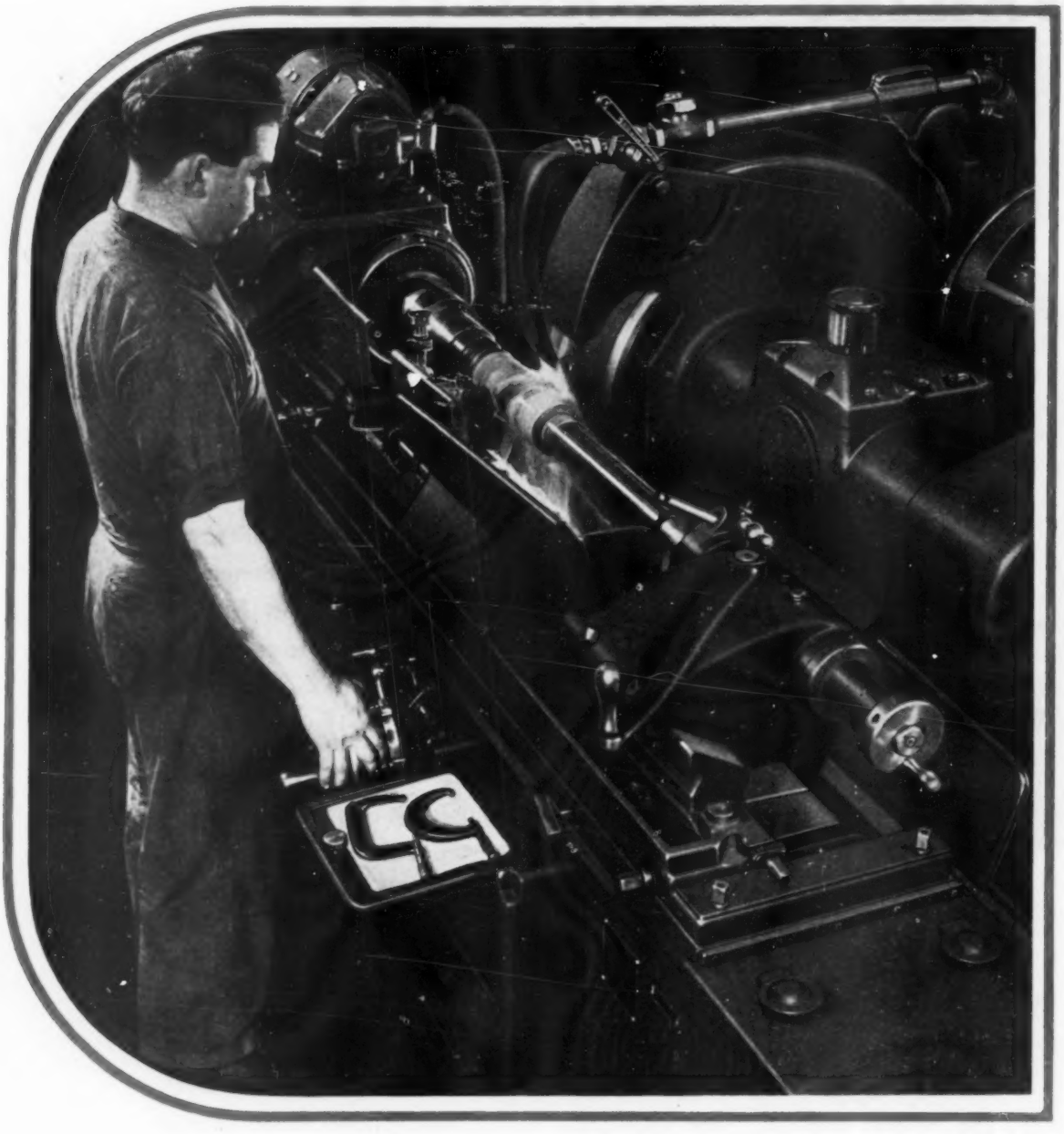
The inherent accuracy built into Original Fellows cutters and Fellow Gear Shapers serve a highly useful function in the production of gears and cams for variable pitch propellers. Here is a case where consistent reliability is absolutely essential, because the lives for our valiant air men, and those of our allies, are dependent upon the proper functioning of this important mechanism. It must not fail irrespective of altitude or climatic conditions.

Heroic accounts of the experiences of our flyers on all battle fronts testify to the superior design and workmanship of our various types of planes — their unequalled speed, maneuverability and reliability. Producing the parts to designers specifications is up to the tools, machines and those who operate them, and Fellows Gear Shapers and Gear Shaper Cutters are, and will continue to play an important part in achieving final Victory. Other Fellows products for the production of gears and other parts are fully covered in our booklet, "The Fellows Method". For your copy, write: The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Building, Detroit 2, or 640 West Town Office Building, Chicago 12.



Method

. . . . FROM BLANK TO FINISHED GEAR



Grinding various diameters on a milling machine spindle. The machine in the illustration is a CINCINNATI 10" Plain Hydraulic Grinder. Table is traversed hydraulically, both hand and power. No effort is required, and the hand wheel remains stationary while table moves in power. This not only cuts operator fatigue, but is quite a factor in safe operation. There are many other features incorporated in this unusually fine centertype grinding machine you'll want to know about. For complete details and specifications, write for catalog No. G-490-1.

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

CINCINNATI G

CIN

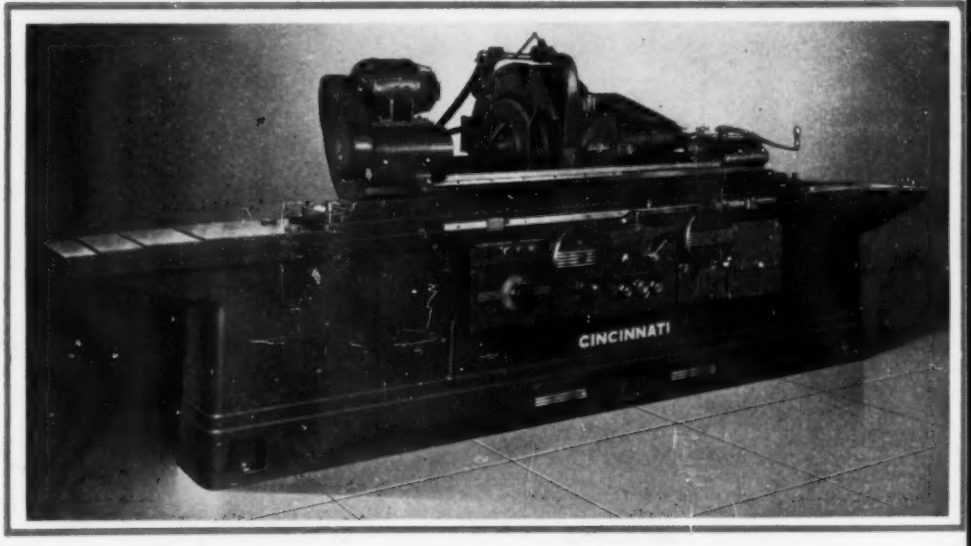
CENTER TYPE GRINDING MACHINES

CEN

Machines that are safe and easy to operate...

REDUCE ABSENTEEISM

The likelihood of hamstringing the war effort because of absenteeism is of grave concern to those responsible for wartime production. Everyone is urged to help put the brakes on this trend toward a letdown. ¶ *You* can do your part in helping eliminate one of the favorite excuses for absenteeism . . . illness caused by fatigue, by installing machines that are easy to operate. For example, machines like the CINCINNATI Plain Hydraulic illustrated on these pages. Because of its hydraulic features and many other refinements, this machine is safe and unusually easy to handle . . . it's extremely accurate, too, and it turns out the kind of work operators are proud of. Men get a kick out of operating these grinders because they know that when the job is finished, it will be right the first time. ¶ Investigate today! Ask the engineers here at Grinding Headquarters for all the facts. This group of experts will be glad to give you complete information and work out any grinding problem.



Illustrated at the right is a CINCINNATI 10 x 72 Plain Hydraulic Grinding Machine(Model ER). Specification catalog G-490-1 covers all features and benefits. Sweet's Catalog File gives brief description of all CINCINNATI Grinding Machines.

GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN

GIVES YOU THESE DISTINCT A

APPLICATIONS:

- HARDENING
- BRAZING
- SOLDERING
- ANNEALING
- MELTING
- AND OTHER SELECTIVE HEATING APPLICATIONS

INDUCT-O

(High Frequency Induction Heating)

ADVANTAGES

UNIFORM HARDENING—Once the proper working coil and heating and quenching cycle of a particular work piece has been established, piece after piece is hardened with identical physical characteristics, as to the heat penetration and the depth of hardness.

POSITIVE RESULTS—Whether the Induct-O be used for hardening or annealing, brazing, soldering, etc., positive results will be obtained because the heating time, temperature, and depth of heat penetration is accurately and automatically controlled.

SAVES TIME—Because the heat is localized to a specific portion of a work piece, induction heating hardens or heats most metal parts in a matter of seconds as compared to hours when other methods such as furnaces, carburizing, etc., are used. Thus once the machine is set up for a particular job, the operator hardens piece after piece in a few seconds.

INCREASES OUTPUT—Because the entire heat-treating operation is automatic, practically no distortion or warping is encountered . . . scale is minimized . . . and chances of human error are eliminated. Add to this the fact that the heating operations are completed in seconds, and it is readily seen how output is increased.

EASY TO OPERATE—To perform any hardening, annealing, brazing, or soldering operations, simply provide the proper fixture and heating coil, then determine the heating time required for the job and proceed with the operation. The average shop worker can easily learn how to operate the machine. No special skill is needed. Changing from one job to another requires only the changing of the work fixture and determining the heating cycle.

CONSERVES ALLOY STEELS—Van Norman Induction Heating Units conserve alloy steels because they enable manufacturers to surface harden parts at the points of wear, giving these sections the strength to stand up under greater stresses. Thus, ordinary carbon steels can be used in many places where more expensive alloy steels were previously used.

REDUCES SPOILAGE—Since warping, scale, and distortion are practically eliminated, rejects through spoilage are minimized, and part after part can be turned out exactly alike.

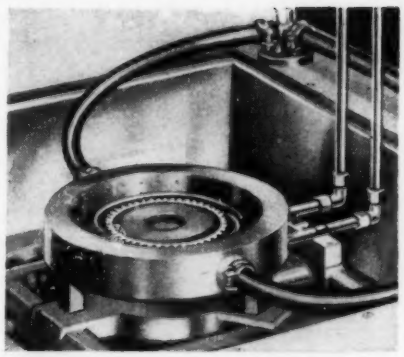
UNLIMITED APPLICATIONS—The Van Norman Induct-O has practically no limit to its applications for hardening, annealing, forging, brazing, soldering, melting, etc., within their work capacities. The only requirement is the use of a proper work holding fixture and heating coil. Shown at left is the 32KW Induct-O with quench table, work-holding fixture and coil for a typical hardening application.

The new Van Norman Induct-O Catalog contains valuable information on the possibilities, advantages and applications of high frequency induction heating. Write for your copy, today.

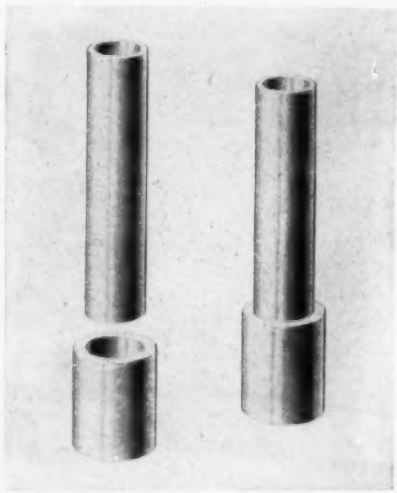
VAN NORMAN MACHINE TOOL CO.

ELECTRONICS DIVISION

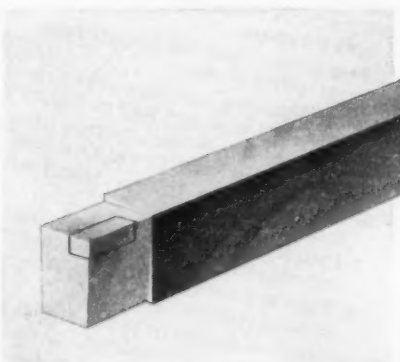
Springfield, Massachusetts



Illustrated is a typical operation . . . surface hardening the teeth of a gear. The total operating time for surface hardening this gear is twenty seconds.



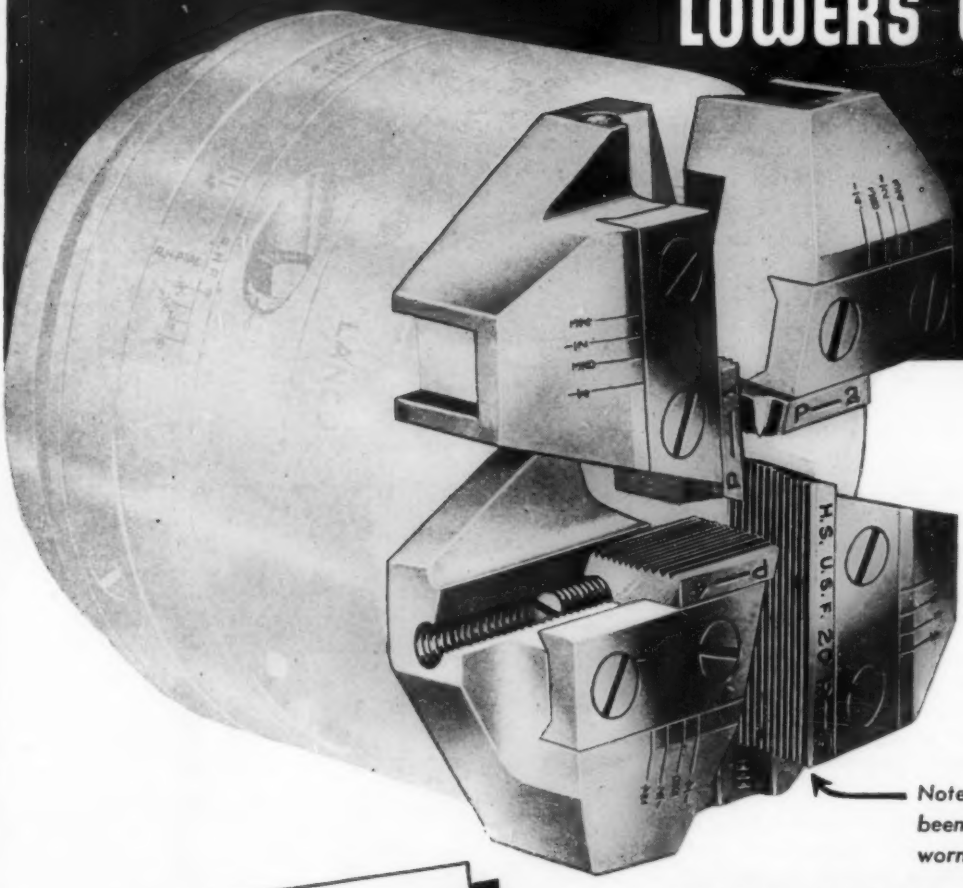
A typical soldering application performed with the Van Norman Induct-O. Irregular as well as regular parts are quickly and easily soldered.



Brazing carbide tips to mild steel tool shank is quickly performed. In illustration, tip is brazed to shank in but a few seconds.

"It pays to Van Normanize"

INTERCHANGEABILITY OF LANDIS CHASERS LOWERS OPERATING COSTS



Note the full length chaser which has been inserted with three practically worn-out chasers to complete the set

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

EACH LANDIS CHASER IS AN INDEPENDENT UNIT

Whenever a Landis chaser is worn or damaged it can be reground or replaced without affecting the remaining chasers of the set. Each chaser is entirely independent of the other. New ones are substituted as needed, as long as the pitch, thread form, and throat remain the same, thereby insuring low operating cost.

The Finest Thread Cutting Tool in Industry

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

LANDIS TRADE—MARK REG. U.S. PAT. OFF.

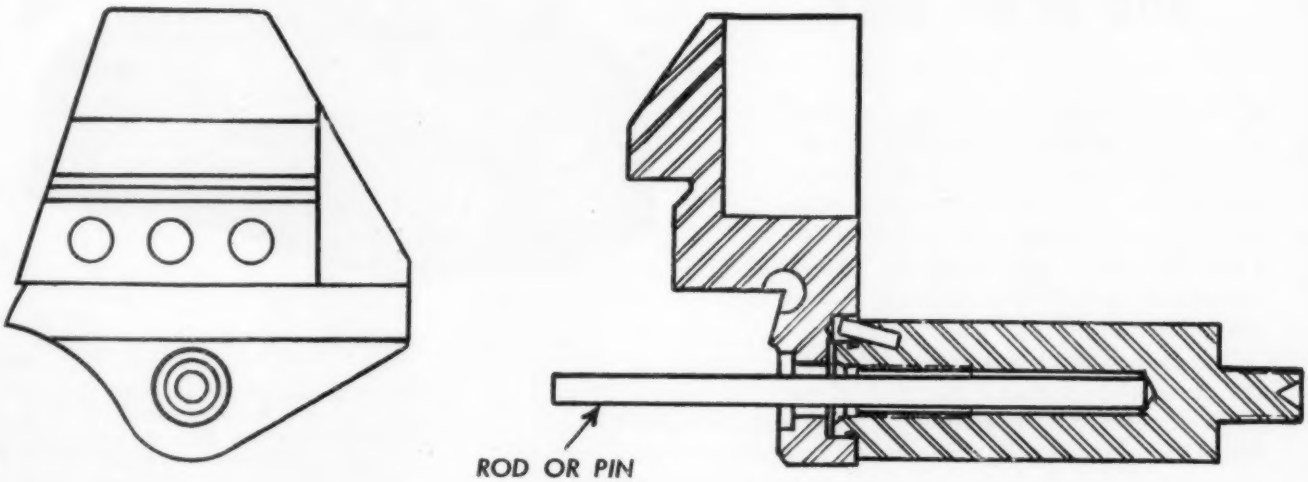
THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

MAINTENANCE COST OF DIE HEADS REDUCED TO THE MINIMUM WITH PROPER HANDLING

RECOMMENDED METHOD FOR REMOVING CHASER HOLDERS WHEN STUCK IN TRUNNIONS



WHEN TRUNNION STICKS IN CHASER HOLDER IT CAN BE REMOVED IN THE FOLLOWING MANNER WITHOUT DANGER OF INJURING EITHER TRUNNION OR HOLDER.

REMOVE CHASER HOLDER SCREW AND INSERT ROD OR PIN THRU CHASER HOLDER TO THE BOTTOM OF DRILLED HOLE IN TRUNNION. BY PULLING UP ON CHASER HOLDER AND TAPPING END OF ROD, CHASER HOLDER CAN READILY BE REMOVED.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

LANDIS MACHINE COMPANY
Waynesboro, Penna., U. S. A.

Do you need Electrolimit Gages?

We expect to have a few available soon, subject to priority rulings and prior sale

SUBJECT to prior sale and the usual priority requirements, a limited supply of Pratt & Whitney Electrolimit Gages may shortly be available *for prompt delivery*. These will be brand-new, ready-to-use P&W External Comparators for outside dimensions up to 4 inches, and a few larger ones with capacity up to 10 inches.

You know the P&W Electrolimit Gage. It is doing 24-hour duty in hundreds of war shops . . . checking the accuracy of vital parts. It doesn't miss. When its needle says ok, that part will assemble accurately, and later perform smoothly on some distant battle front. And best of all, when we some day go back to peace time production, this same gage will continue to work with no change whatever! It has a thousand and one applications. You'll find it right at the machine for the operator's use — and you'll find whole batteries at work in final inspection departments.

If you are interested, we suggest you phone or wire *now* . . . this anticipated selection will be sold to first-comers in their priority sequence. Address our nearest branch office, or contact our headquarters . . . Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Conn.

The P&W Electrolimit Gage — a high-speed, high-accuracy inspection instrument. Through its mechanical-electrical mechanism, it magnifies errors up to 20,000 times . . . makes checking swift and sure. Quickly set with a master or a set of gage blocks, it registers variations over and under the setting with readings directly in "tenths" or finer. Use it for any and all external dimensions within its range. We'll gladly send you descriptive literature.

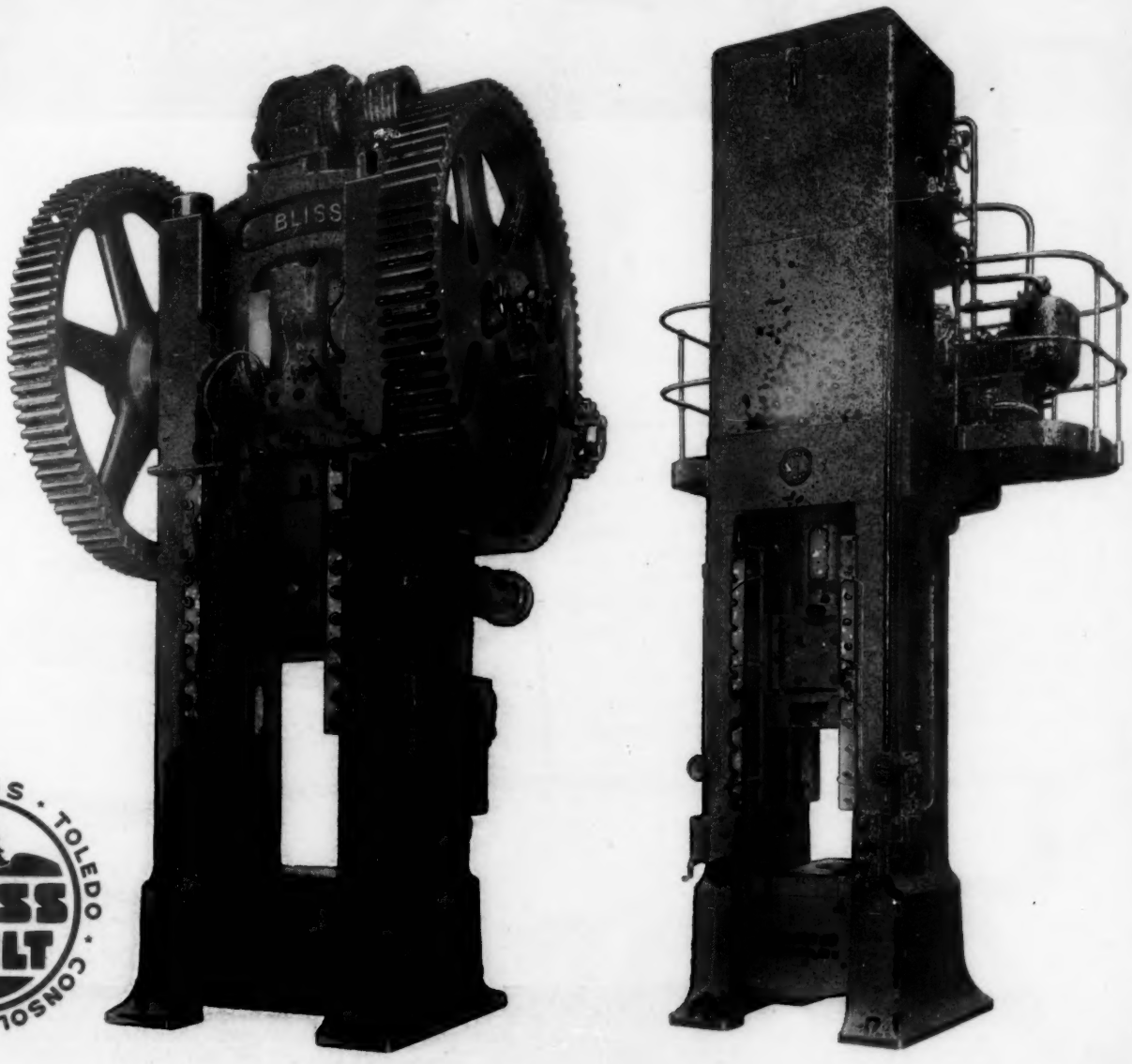
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

There is no better paying investment than the right tools for the job.

MECHANICAL OR HYDRAULIC PRESS?



MARQUETTE · BLISS · TOLEDO · CONSOLIDATED
BLISS BUILT

IN THE PRESS INDUSTRY there are particular applications of presses for which only the mechanical press is suitable. At the same time, other uses find the hydraulic system essential. There is also a wide field wherein either press may be used and where the advantages of each must be weighed carefully before a final choice is made. This applies alike to both single-action and double-action presses.

In this middle field, the variable factors to be considered before selecting either type can best be weighed by an organization which builds both types, and will therefore be completely impartial in its recommendation. This unprejudiced judgment is demonstrated by the installation of both Bliss Mechanical and Bliss Hydraulic Presses on all six continents.

Call Bliss for unbiased press recommendations.

E. W. BLISS COMPANY

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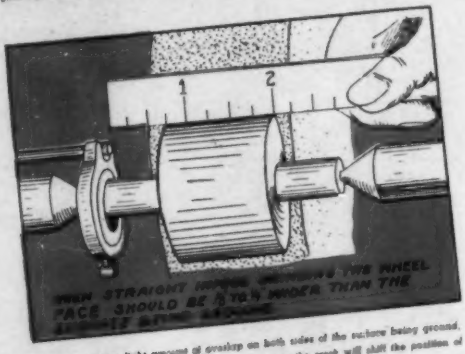
Chapter XII

GRINDING WHEEL WIDTH

At first thought the width of the grinding wheel may not seem important. Quite true, a wheel may be made to produce work as accurately and with as good a finish if it has a ½" face, a 1" face or a 2" face. But the time required to do this is an important element and this time will always be less when a wheel with the largest possible face width is employed.

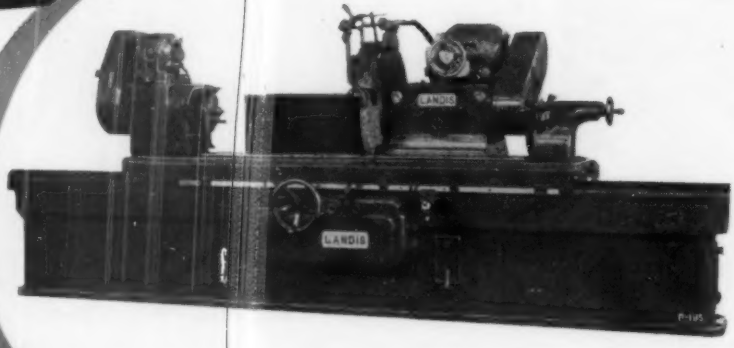
This is not always practical when a machine is being used for the small lot grinding of a wide variety of parts. Then the width of the wheel will have to be determined by the requirements of the smallest part or the limitations of the machine being used. Where high production is the order of the day there should never be a compromise, however.

It is ordinarily safe to assume that the wheel width recommended by the manufacturer for any given machine will be found the best. As long as the machine is used for the purpose intended when it was originally purchased, this is generally true.



If there is not a slight amount of overlap on both sides of the surface being ground, any slight variation in the depth of the centers in the work will shift the position of the work. The result of this would be a slight ridge on one side

The ideal width of a grinding wheel for any given job is determined by several variable factors. Tied in with correct grinding wheel width are such other considerations as work carriage traverse speed, work speed and wheel speed. All four of these subjects are fully explained in the book "Better Grinding," which may be secured by mailing the coupon at the bottom of the opposite page. Altogether, the book's eighteen chapters make a practical, easy-to-take course on the subject of precision grinding.



THE LANDIS 10" - 14" TYPE C PLAIN HYDRAULIC GRINDERS

- **Recommended for the longer shaft and spindle work and for miscellaneous medium size parts requiring a plain machine.**
- **Used by many war industries — particularly airplane engine and gun manufacturers.**
- **Both swings available in 18", 36", 48", 72", 96" and 120" lengths.**

IF YOU HAVE A GRINDING PROBLEM

Let George do it

LANDIS TOOL COMPANY

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George Grindit Says

"When anyone asks me how wide the grinding wheel should be, I am reminded of the classic question: What size pair of trousers will fit an elephant? The answer to both questions is just about the same—It depends. Yes, it depends on the size of the job at hand where grinding wheel size is involved just as it depends on the size of the elephant where the size of the trousers is involved."

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

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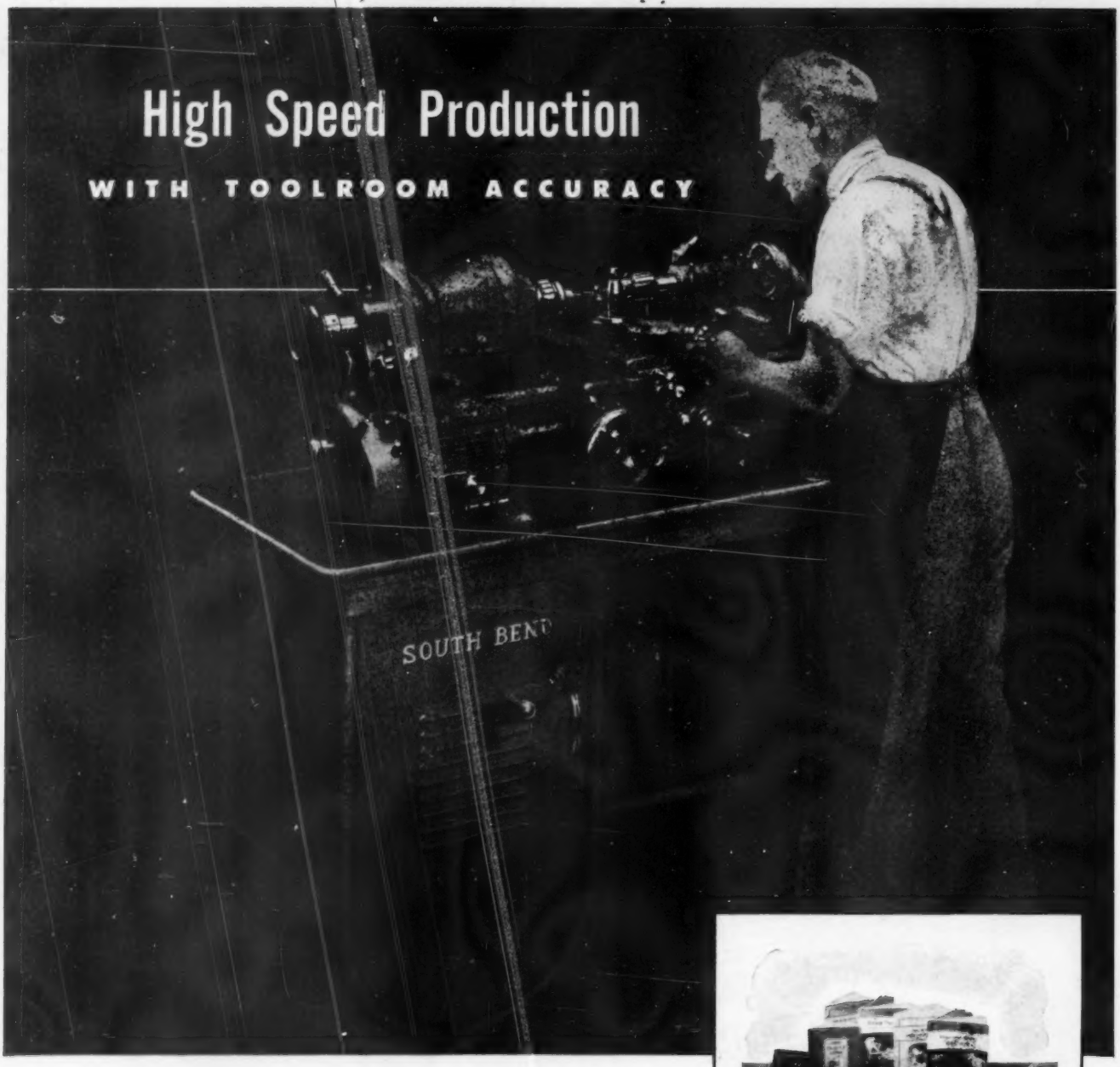
LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

WAYNESBORO, PENNSYLVANIA

High Speed Production

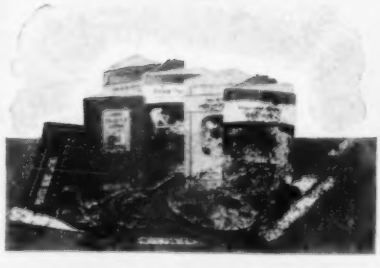
WITH TOOLROOM ACCURACY



War Production demands maximum speed and absolute precision. Both of these requirements are met in hundreds of war plants with South Bend Lathes.

Their rigidity and wide range of spindle speeds permit taking full advantage of the higher cutting speeds possible with tungsten-carbide tools. Their dependable accuracy makes it possible to machine work with such precision that subsequent finishing operations can often be omitted.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes, 9″ to 16″ swings. Write for a catalog and the name of our nearest distributor.



Use **THESE BOOKS AND FILMS ON LATHE OPERATION**

South Bend training helps — books, sound films, wall charts, and bulletins on the care and operation of a lathe — are available for training new operators. Write for Bulletin No. 21-C.

ARMY E NAVY

SOUTH BEND

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS SOUTH BEND, INDIANA, U.S.A.

IN THE TOOL ROOM OR ON THE PRODUCTION LINE

Built to "dish it out" and take it, too, Uncle Sam's tanks demand tough materials and skilled design to give them stamina and striking power.

The same principles hold for milling machines —the machine tools that are mighty important in building tanks and other weapons. In tool room or on the production line, milling machines must be built to perform at a record-breaking pace and maintain close tolerance-accuracy in operation.

The center bearing on the spindle of Milwaukee Milling Machines reduces by one-half the distance between bearings—*increases rigidity eight times!*

Ask the man at the controls of a Milwaukee—he can tell you how important this center bearing is (in addition to the husky column) in providing built-in rigidity and all that it means in sustained accuracy — longer cutter life —smoother performance at all speeds and feeds.

KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

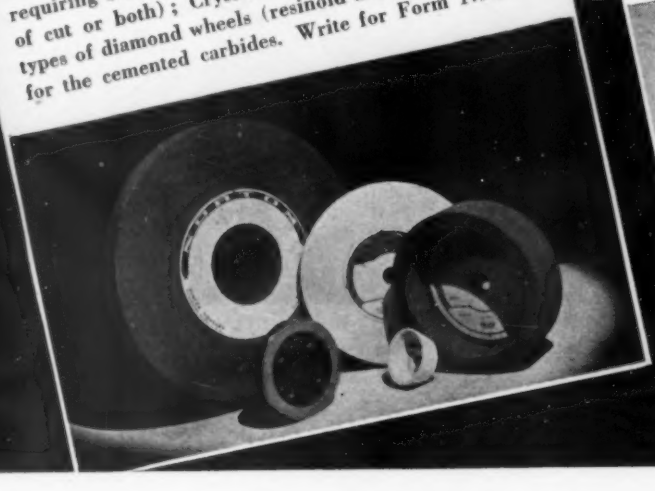
Buy Victory with at least 10% in War Bonds!

Milwaukee **MACHINE TOOLS**

NORTON ABRASIVES

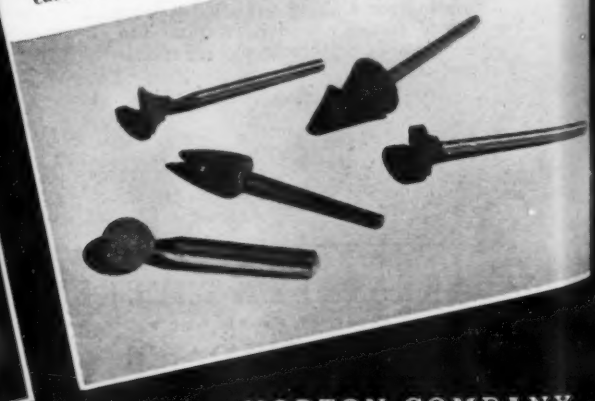
Tool Grinding

TOOL sharpening is an important operation in every airframe plant. Norton has a complete line of wheels—Alundum and 38 Alundum abrasive, BE bond wheels for high speed steels and the cast alloys (including the Norton Open Structure Wheel for jobs requiring extra heavy stock removal or extra coolness of cut or both); Crystolon vitrified wheels and two types of diamond wheels (resinoid and metal bonded) for the cemented carbides. Write for Form 1793A.



Burring

BURRING is an important finishing operation on thousands of aircraft parts—both in the airframe plants and the motor plants. And many of these burring operations are being done with Norton Mounted Points and Mounted Wheels. They are available in nearly 200 standard sizes and shapes. Made of Alundum or Crystolon abrasive, with vitrified, resinoid or rubber bond, they are securely cemented on rust-resistant steel spindles. Complete catalog (Form 43A) on request.

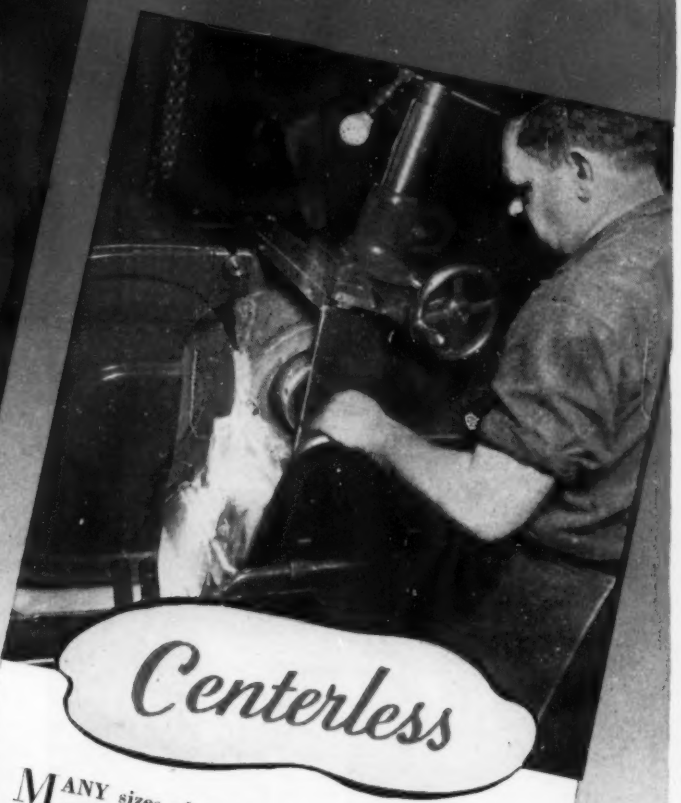


NORTON COMPANY

. . . in the Plane Plant

Cutting Off

THE cutting of tubing is a major operation in the airframe plants. In some of the larger planes hundreds of feet of it are used. Norton Cut-off Wheels are available in both Alundum and Crystolon abrasives (the latter especially effective for cutting aluminum) and in resinoid, rubber and shellac bonds. They are made for both wet and dry cutting and in a variety of diameters and thicknesses. Write for booklet No. 517A giving wheel specifications for different kinds of tubing.



Centerless

MANY sizes of studs and bolts as well as a large variety of other parts, both large and small are O. D. ground by the centerless method in the plane plants. Norton wheels are available of Alundum abrasive for grinding steel and of Crystolon abrasive for grinding the non-ferrous metals. And there are Norton regulating or feed wheels in the right specifications for each job. Form 2006A on O. D. grinding will be sent on request. It gives information on cylindrical grinding, too.

WORCESTER, MASS.

AMERICAN

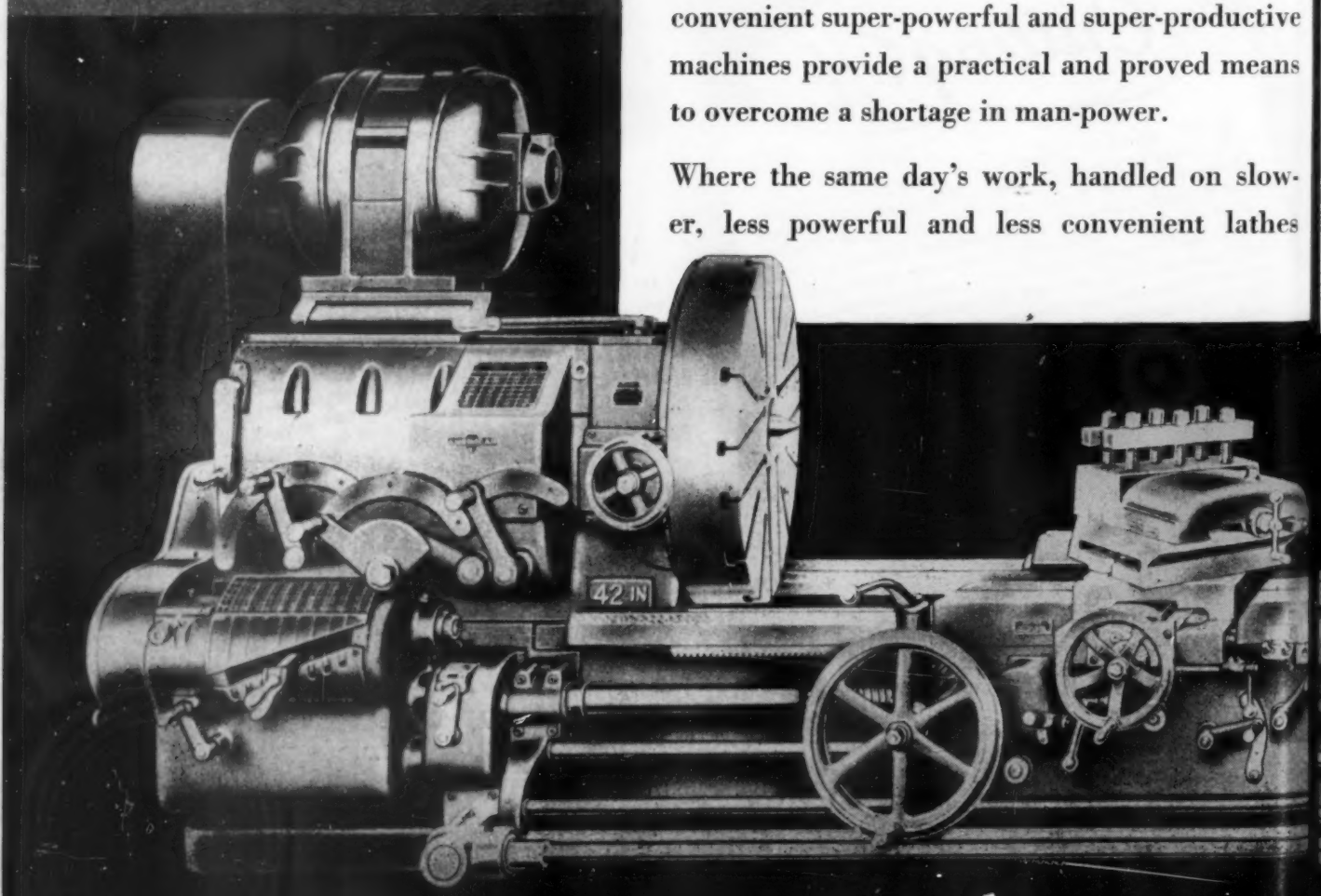
FOR ALL-OUT PRODUCTION

Here's the solution to manpower

"AMERICAN"

Truly "AMERICAN" in the way they handle big work with a minimum of effort, these modern, convenient super-powerful and super-productive machines provide a practical and proved means to overcome a shortage in man-power.

Where the same day's work, handled on slower, less powerful and less convenient lathes



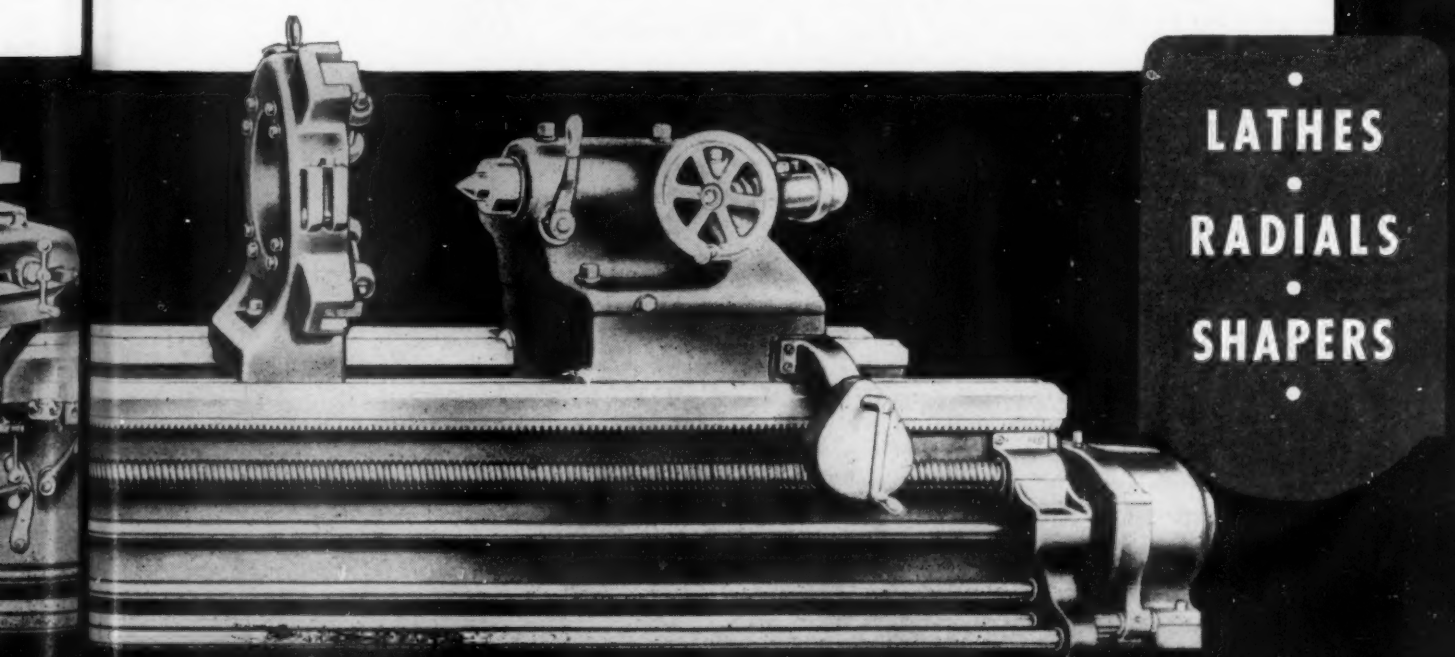
The AMERICAN

onto the Problem of ershortage on BIG WORK

N Super Productive LATHES

might ordinarily require two machines and two operators, one man and an "AMERICAN" can often easily walk away with it. Centralized, convenient controls assure simple, almost effortless handling of even the biggest jobs.

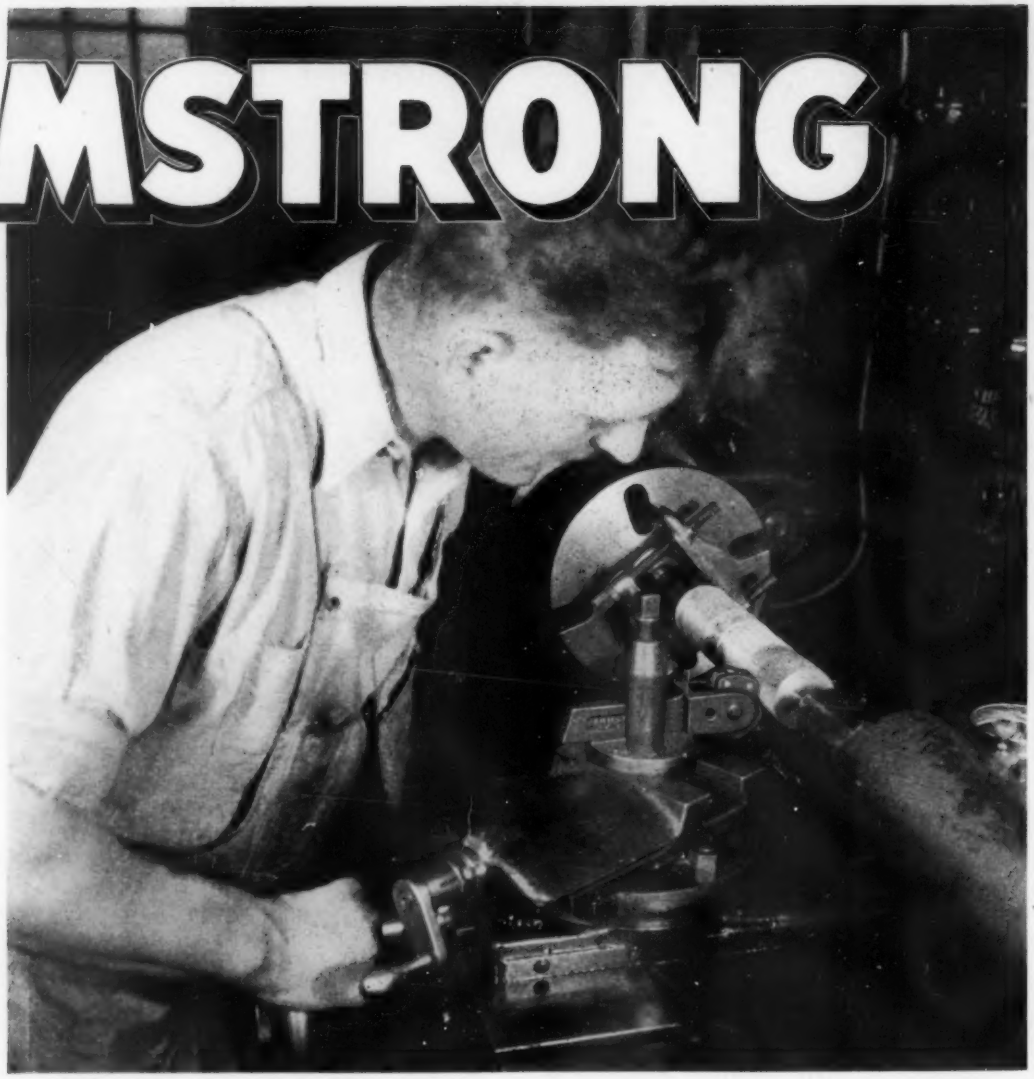
If you are faced with man-power shortage, a practical, positive way to ease the situation is to put machines to work that produce more per day with least possible manual operating effort. "AMERICANS" provide the solution. You can go all-out in your production with these modern machines.



• LATHES • RADIALS • SHAPERS •

AN TOOL WORKS COMPANY *Cincinnati, Ohio*

ARMSTRONG



Even a "green" apprentice will turn out knurling with an ARMSTRONG Knurling Tool

In the hands of even your most skillful operator your knurling can be no better than your knurls and the tool that holds them, for knurling is a forming operation, a reproduction of a pattern from a master. Still the most inexperienced apprentice with an ARMSTRONG Knurling Tool will produce uniform, fully formed, clean-cut knurling that fairly sparkles.

This is because ARMSTRONG Knurls are hob-cut—provide a clear cut master. In an ARMSTRONG Knurling Tool the pressure on matching knurls is always uniform; is automatically equalized because the tool itself is self centering. The alignment too, is rigidly held, and knurls "track" exactly no matter how engaged for the large knuckle joint of this tool has sufficient strength and bearing on the shank (315°) to absorb not only end thrust but any side strain or torsion.

ARMSTRONG Hob-cut Knurls come in both "straight" and "diamond" patterns, each in "fine", "medium" and "coarse". ARMSTRONG Knurling Tools come in 5 sizes. With knurls instantly interchangeable each effectively equals a complete set of knurling tools. Standardize on ARMSTRONG Hob-cut Knurls and ARMSTRONG Knurling Tools and your knurling problems will disappear. You can get them from stock at any Mill Supply house.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"

315 N. Francisco Ave. Chicago, U. S. A.

Eastern Warehouse & Sales Office:
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Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

DUPLICATE PARTS FOR WEAPONS OF WAR PRODUCED IN UNPRECEDENTED QUANTITIES

...a P&J achievement

Accurate parts for war materiel are being produced in remarkably fast floor-to-floor time on P & J Automatic Chucking Equipment.

Many bottlenecks have been eliminated in the production of airplanes, motor vehicles, tanks, guns, and shells by the versatile tooling set-ups available in P & J equipment, which make possible the handling of roughing and finishing operations in a single cycle. Then, too, P & J equipment is helping solve the problem of man-power shortage because convenience and automatic features enable one operator to handle several machines simultaneously.

More and still more parts in less and still less time is the objective toward which P & J engineers are constantly working. If this is your objective, too, ask for P & J assistance.

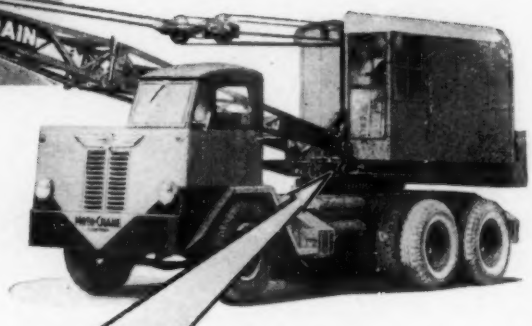
***The* POTTER & JOHNSTON MACHINE COMPANY**

Pawtucket, R. I.

More Bonds - less Bondage

COURTESY OF U. S. NAVY RECRUITING BUREAU

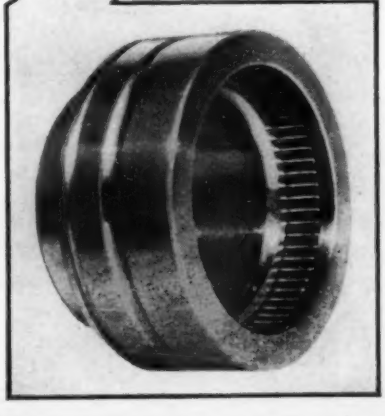
THEW-LORAIN MOTO-CRANE puts RBC NEEDLE BEARINGS in a tough spot



When we say "tough spot" we mean just that — for RBC CYCLOPS Needle Bearings are used in the front turntable rollers of Moto-Crane Models MC-6x6 and MC-4.

Such units are employed in steel erection, building construction, road building, pipe lines and material handling for many military and naval installations as well as extensive industrial and public works projects.

RBC CYCLOPS Bearings are designed and built to withstand heavy radial and shock loads and in this application they maintain correct alignment and insure smooth operation. Perhaps this will suggest to you a use for RBC Bearings where high load carrying capacity and anti-friction qualities are of vital importance.

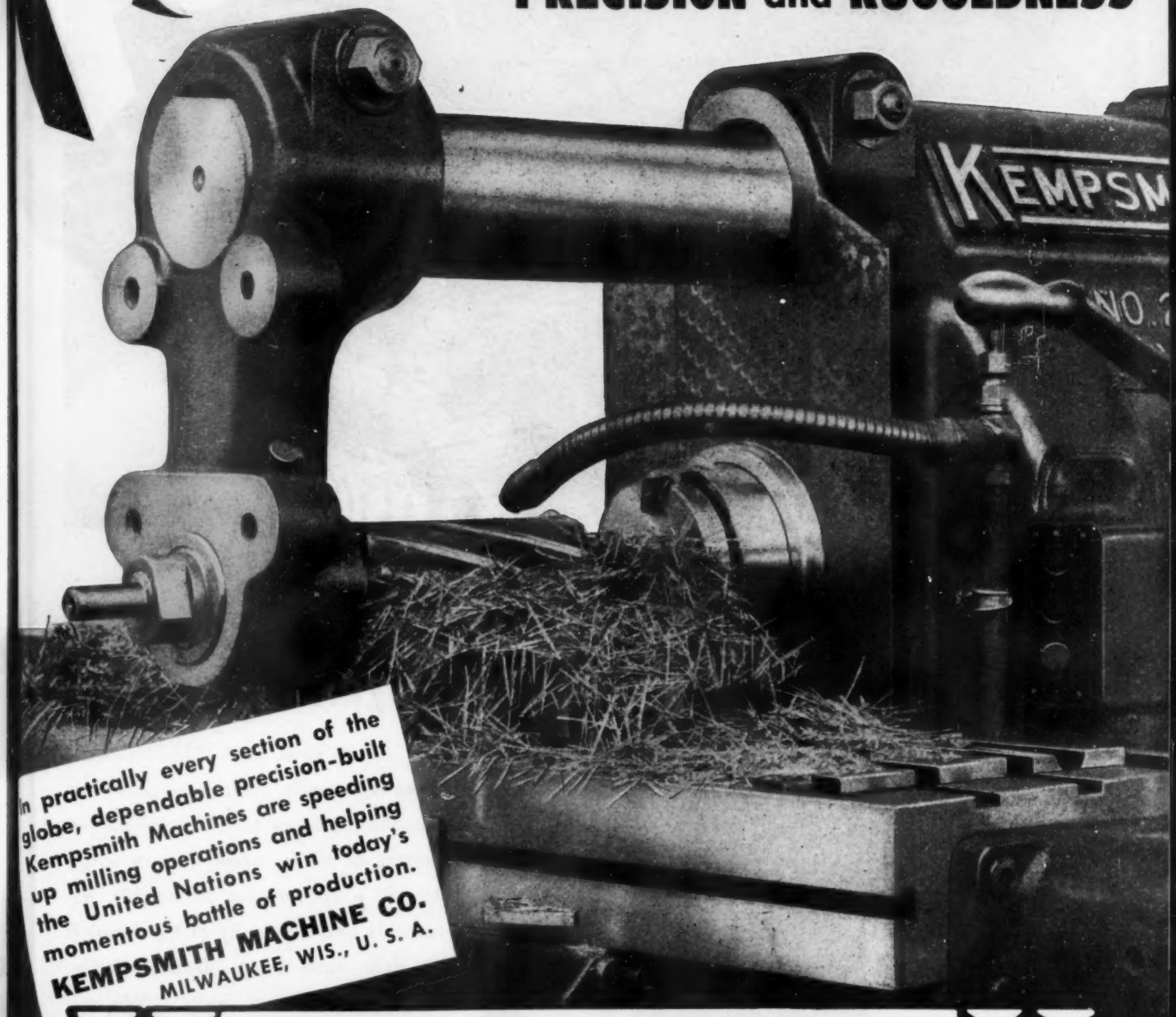


ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY

FOR 55 YEARS

Kempsmith Millers Have Enjoyed a World-wide Reputation for PRECISION and RUGGEDNESS



In practically every section of the globe, dependable precision-built Kempsmith Machines are speeding up milling operations and helping the United Nations win today's momentous battle of production.

KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.

KEMPSMITH

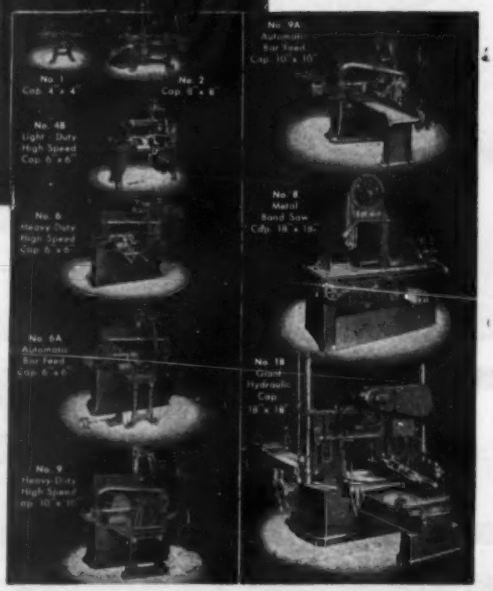
Precision Built Milling Machines Since 1888

MARVEL SAWS

handle orders as they come, at Jones & Laughlin Warehouse

Top: No. 9A MARVEL Production Saw automatically cutting-off quantity run—3 bars at a time. This heavy-duty all-ball-bearing machine cannot be surpassed in speed, simplicity, ruggedness and dependability.

Below: A universal No. 8 MARVEL Metal-cutting Band Saw, that cuts-off, miters, notches or cuts at any angle from 45° right to 45° left. Blade feeds into the work.



Hot rolled and cold finished steel squares, rounds, hexagons and flats —single pieces or hundreds of pieces, lengths or slices, small bars or large (to 18" x 18" are cut off quickly, accurately and efficiently at the Jones & Laughlin Steel Corp. Detroit Warehouse with Marvel Saws. "We are very pleased with all machines" sums up their MARVEL experience.

ARMSTRONG-BLUM MFG. CO.

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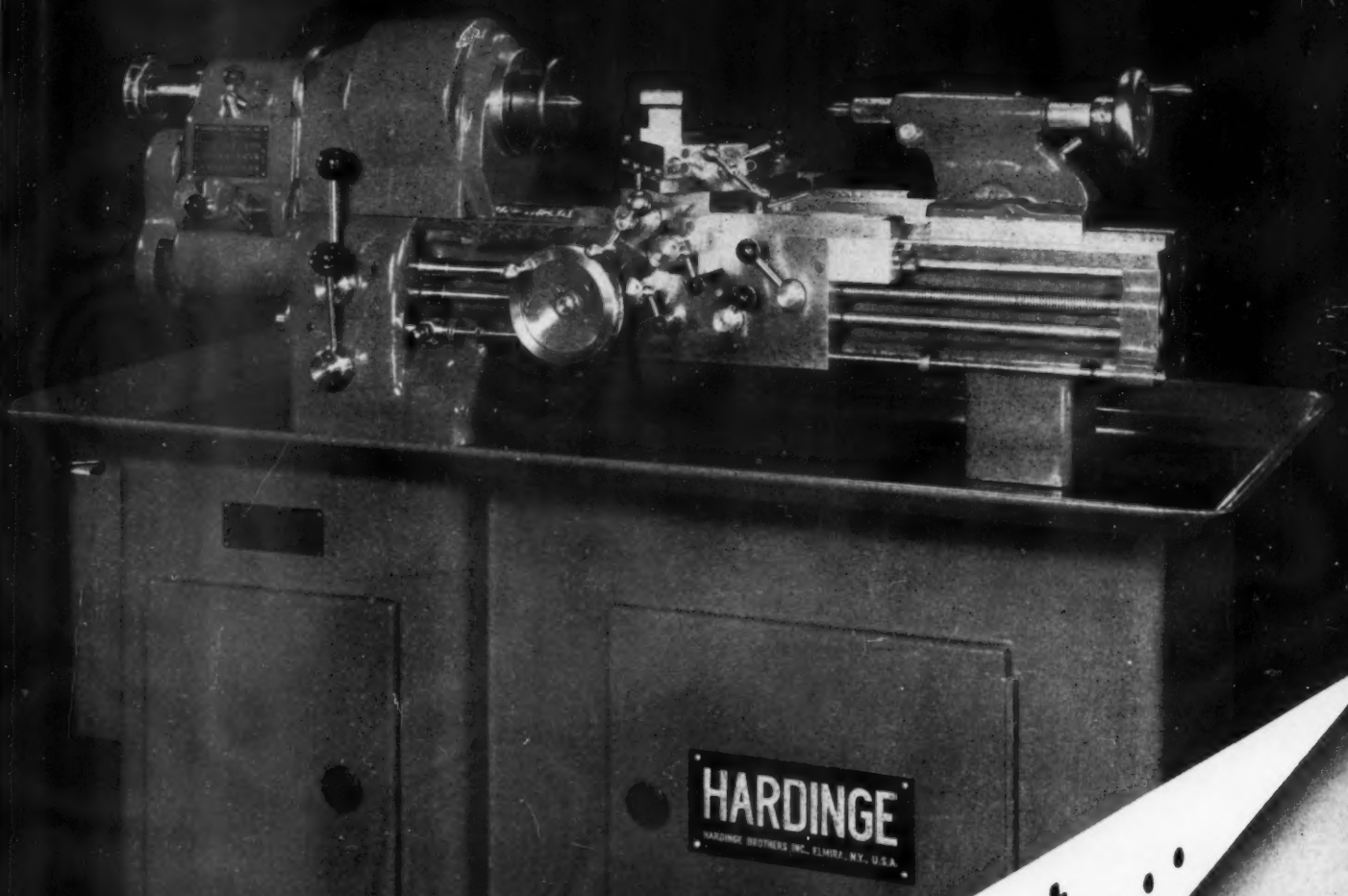


Announcement . . .

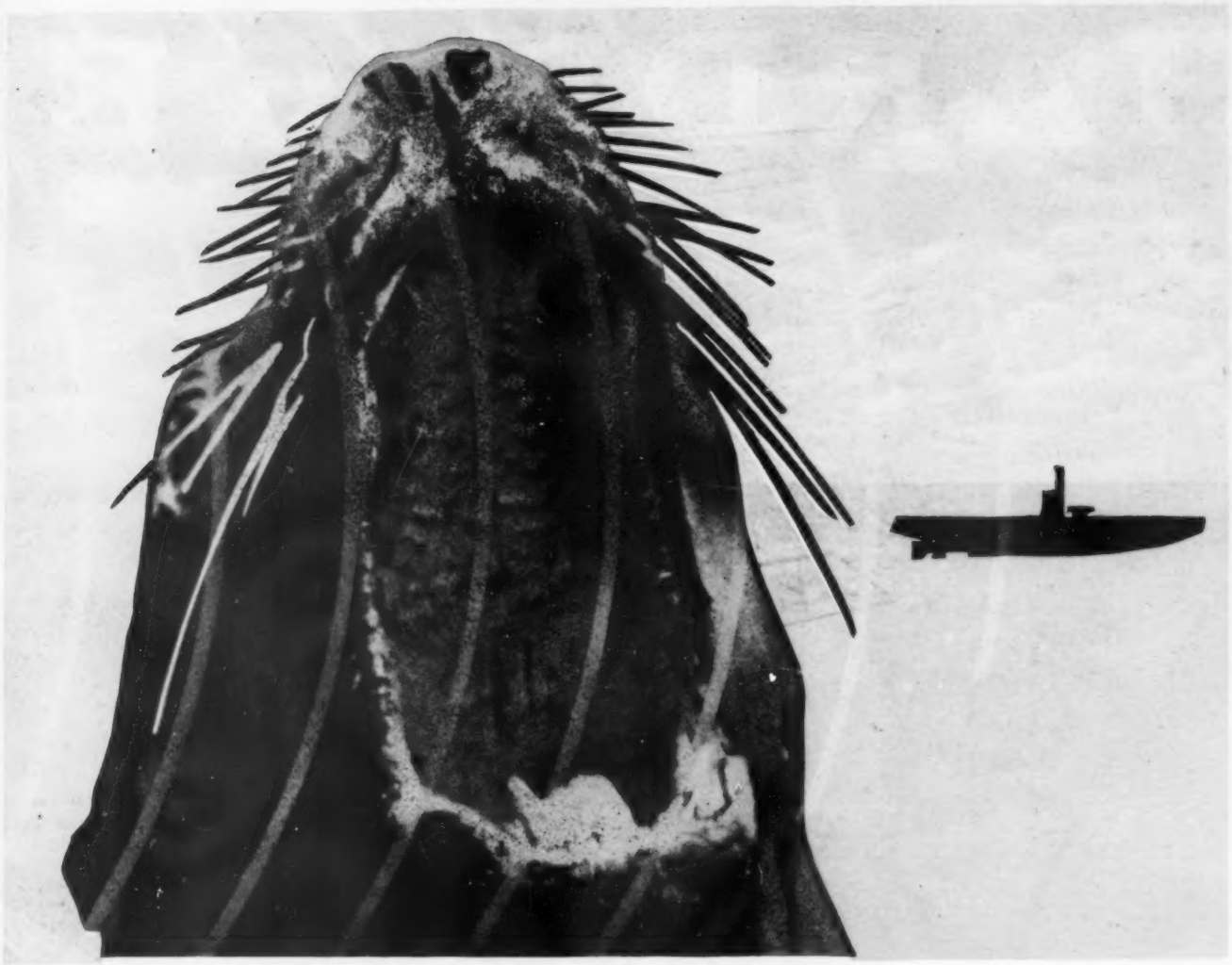
Our production of the HARDINGE Precision Tool Room Screw Cutting Lathe has been concentrated on specific Government requirements. Having fulfilled those urgent requirements, we can again offer reasonable deliveries on this machine.

The HARDINGE Precision Tool Room Screw Cutting Lathe brings precision production to your tool room for speedy turning, boring and threading operations. Ask for descriptive bulletin and price quotation.

SPECIFICATIONS—1" collet capacity, 9" swing, 16" center distance, sixteen spindle speeds from 27 to 1750 r.p.m.

Performance has established Leadership for

HARDINGE
ELMIRA, N.Y.



Spotter for undersea raiders...

SEA LIONS beat their cousins, the seals, out of an important job during the early part of World War I. Both have a hoarse, barking voice. But sea lions have sensitive, external ears...seals do not.

So sea lions got the job of detecting U-boats. They were trained to bark like fury whenever they heard the vibrations of an approaching undersea raider.

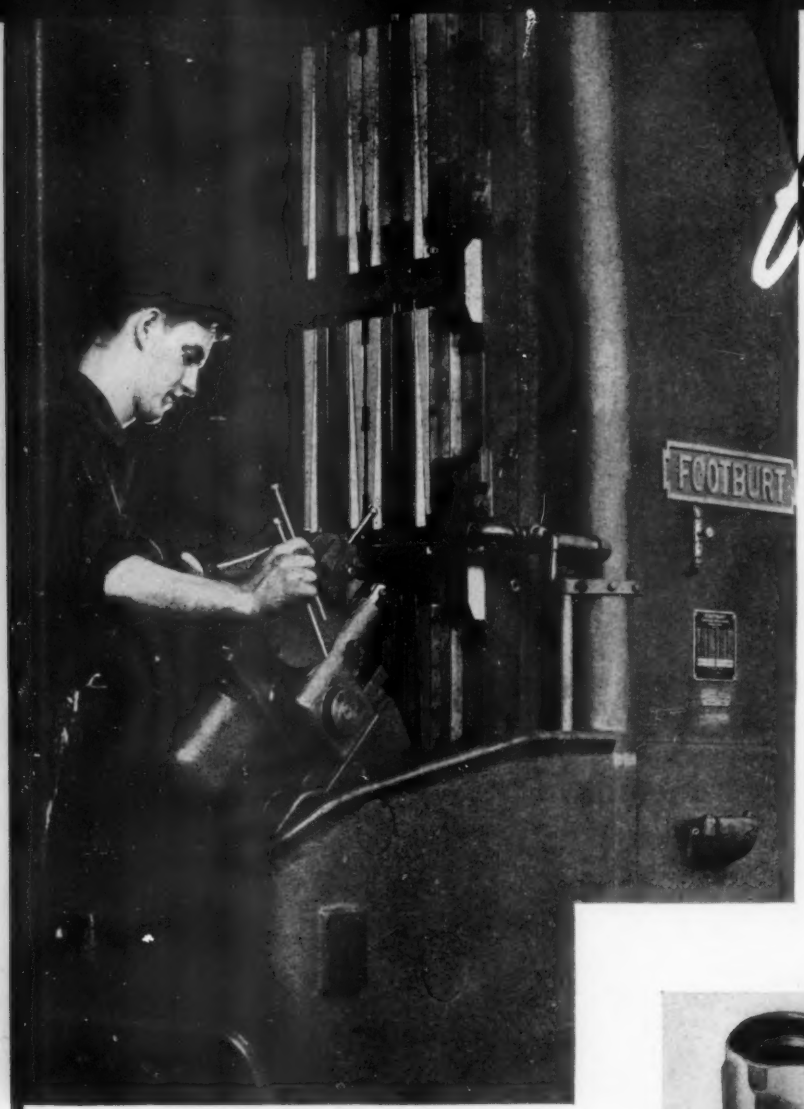
Today, there are many devices for detecting the approach of submarines, but none of them depends on animals. All either depend on machines, or they are constructed with the help of machines.

The heavy responsibility of these machines is illustrated by the fact that during the last war, German U-boats destroyed 5,408 vessels, or 11,189,000 gross tons of shipping. Today, Germany is building 20 submarines a month, each of which can potentially sink, on a single raiding trip, as many as 14 ships!

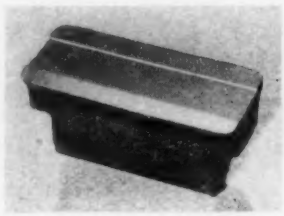
But this is only one of the wartime responsibilities of the machine tool industry. Our nation's production of airplanes, tanks, jeeps, anti-aircraft guns and munitions—all this stems from machine tools.

In wartime production, when speed is vital, the output of Cone Multiple Spindle Automatic Lathes is of especial importance. These machines can, in many operations, increase the production range as much as 10 times, depending on the character of the work. This is one of the reasons why Cone Automatics will continue to make history after victory is won.

ONE Automatic Machine Company, Inc., Windsor, Vermont

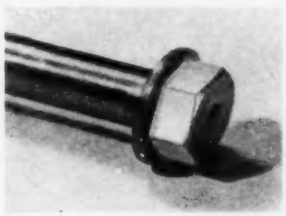


for faster machining



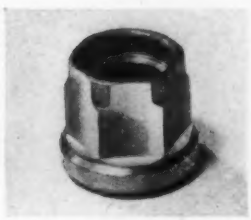
Long flat cut held to close limits.

End cut at double angle.

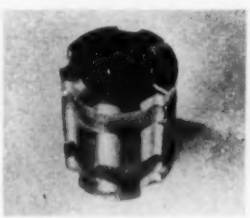


Hexagon broached on long bolt.

Connecting rod cap broached, top and sides.

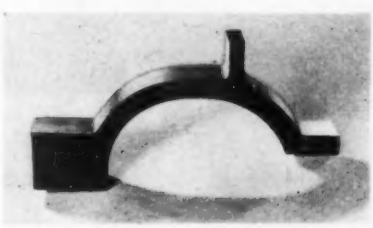


Hexagon nut broached in single operation.

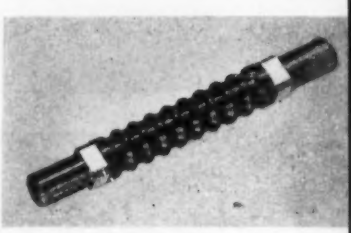


Long slots broached around diameter in two strokes.

Eccentric straddle broach.



Entire countour broached on irregular form.



Squares broached on both ends in one operation.

★ Footburt Surface Broaching Machines have been showing remarkable saving on many war contracts; through faster production per man and in lower tool maintenance costs. Many jobs that were slow and expensive when handled by conventional machining methods are now being surface broached faster and cheaper on Footburt machines. Production in most cases is as fast as the speed at which parts can be loaded, yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you. Send your blueprints and production requirements.

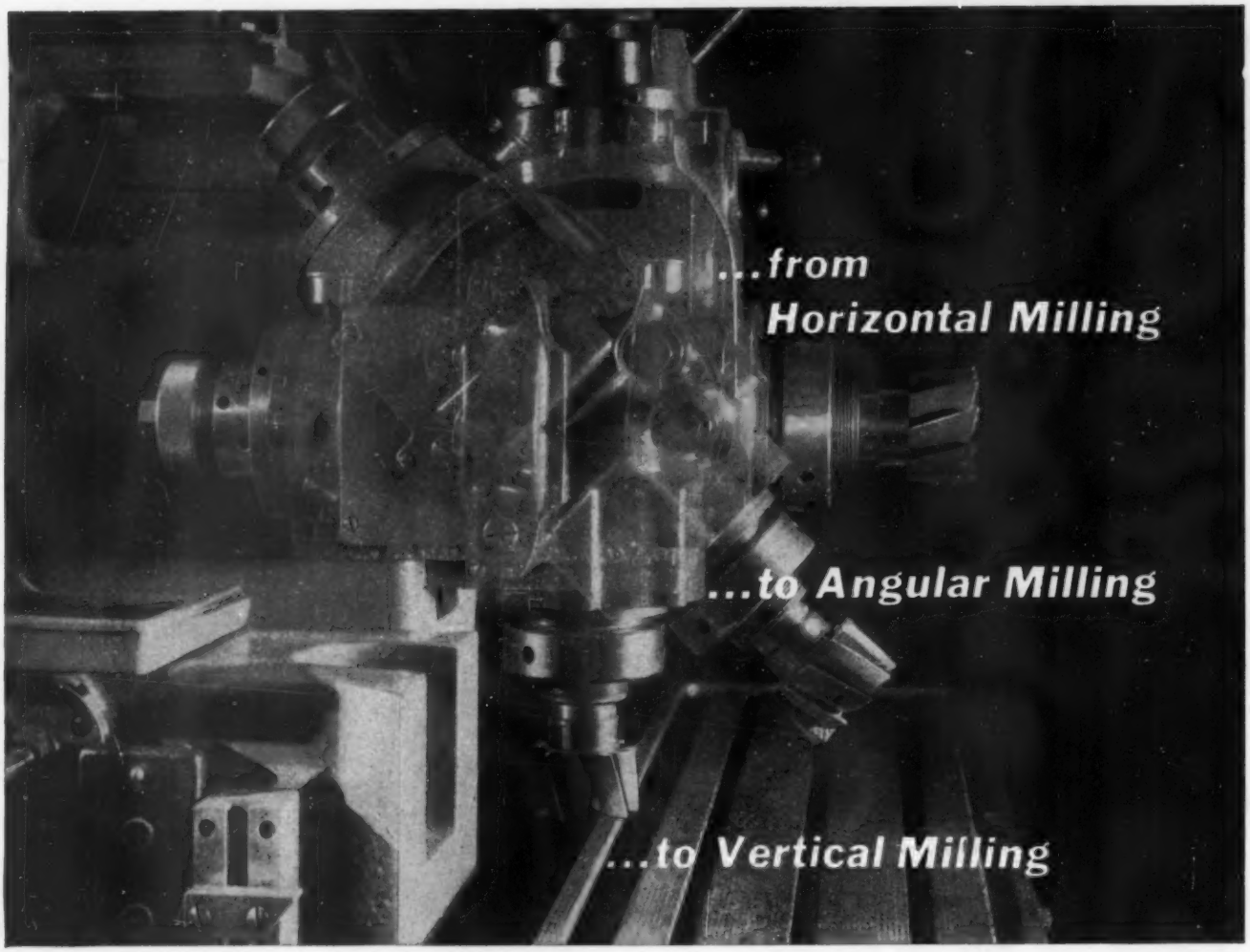
THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: General Motors Building

★ *MOVE UP THE SCHEDULE —WIN THE WAR QUICKER!* ★★

FOOTBURT *Surface* BROACHING

Quick Changes on Van Norman

RAM-TYPE MILLING MACHINES



When the operator has completed a horizontal cut on a Van Norman Ram-Type Miller, and wishes to proceed to an angular or vertical cut . . . *he does not need to touch the set-up on the table.* All he has to do is unclamp the swiveling cutterhead, swing it to the required position, reclamp . . . *and start the next cut.* Only a matter of moments, compared with the time needed to reset the work. And one of the greatest sources of errors is completely avoided. This exceptional ease and convenience of operation provide gains in time, accuracy and output. So today, throughout America's war industries, Van Norman Ram-Type Millers are delivering the goods in great plenty . . . and in plenty of time.

VAN NORMAN
Machine Tool Company
SPRINGFIELD, MASSACHUSETTS

ARMY E NAVY

In June, 1942, Van Norman was awarded the Army and Navy E in recognition of its war production record

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

THIS DIAGRAM SHOWS HOW "CHATTER" DEVELOPS

HOW TO SOLVE

Operating Problems with *Correct Lubrication*

1 SLIPPING

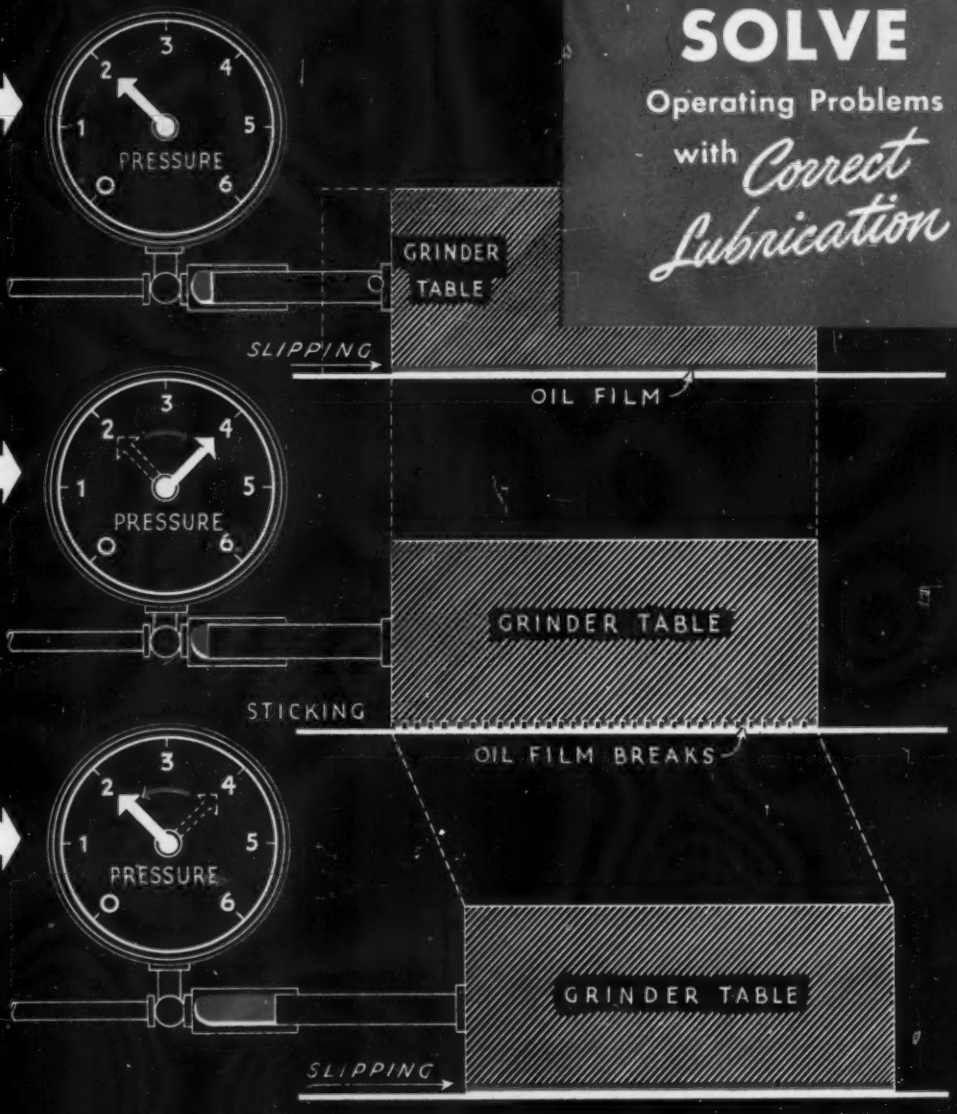
This diagrammatic drawing shows a grinder table moving ahead slowly under normal actuating pressure.

2 STICKING

The oil film breaks. Friction stops the table. The actuating pressure builds up to overcome the increased friction.

3 SLIPPING

The table jerks ahead. Pressure momentarily drops to normal. The table will immediately stick again.



Prevent "Stick-Slip" Chatter on Precision Grinders

THERE IS a special oil—Gargoyle Vacuoline Oil 1409—made to prevent "chatter" in grinding operations.

This oil has a thin, strong film that provides a minimum of "break-away" friction. It is made to eliminate Step No. 2 in the diagram above.

It is also made to eliminate "over-run" of the cross-slide which results from the same cause as "chatter."

In addition, it is an efficient hydraulic fluid—an ideal oil for hydraulically driven precision grinders.

Use Gargoyle Vacuoline Oil 1409 for assurance of securing fine finishes and meeting exacting tolerances.

GARGOYLE Lubricants

SOCONY-VACUUM OIL CO., INC.—Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Co. • General Petroleum Corporation of Calif.

USE GARGOYLE VACUOLINE OIL 1409

Parallels, 2 per set, about .0125 varianess.
Price $75.00

Optical Flat used to compare various combinations of gage blocks for size and wear.

TEST YOUR GAGES AND LAPPED PARTS

for PARALLELISM and FLATNESS with SCHERR OPTICAL FLATS . . . . . .

With the use of Scherr Optical Flats an accuracy in planeness within .000004 can be quickly and easily checked.

In checking the condition of a gage block for planeness, the Optical Flat is slid upon the lapped surface. The character of the interference bands that appear will disclose whether the surface is plane or whether uneven wear has occurred.

Operating on the principle of light wave interference, the thin air space between the flat and the lapped surface permits light waves to occur in successive, perfectly even layers of a number of different colors. The height of each layer of color is approximately .000015. The way in which these color layers appear indicates the amount of deviation from a perfectly flat surface.

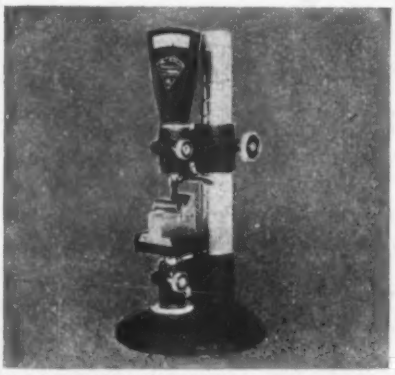
Scherr Optical Flats assure the closest possible scientific means of checking parallelism and planeness of micrometer anvils, as well as gage block and lapped surfaces of parts for planeness. In addition to the 2 piece set of Micrometer Parallels illustrated, Scherr is prepared to make special sizes up to 5" diameter.

Complete detailed information is available promptly on request

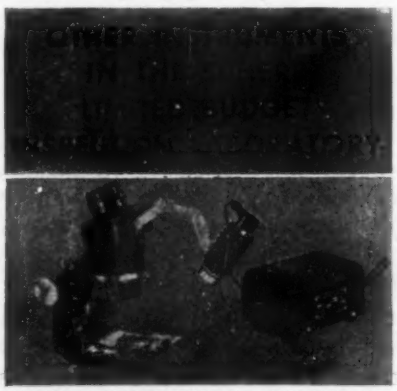
Optical Flat placed on gage block.

Irregular pattern of interference bands produced by unevenly worn surface.

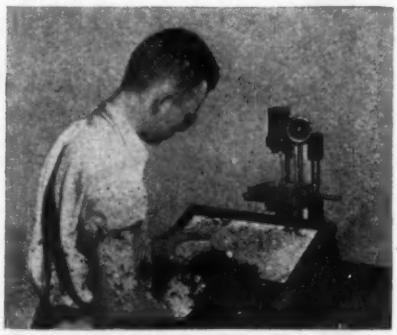
Straight or nearly straight lines, indicated a perfectly plane surface.



SCHERR COMPARITOL for checking gage blocks, gages and work for size, accuracy and wear.

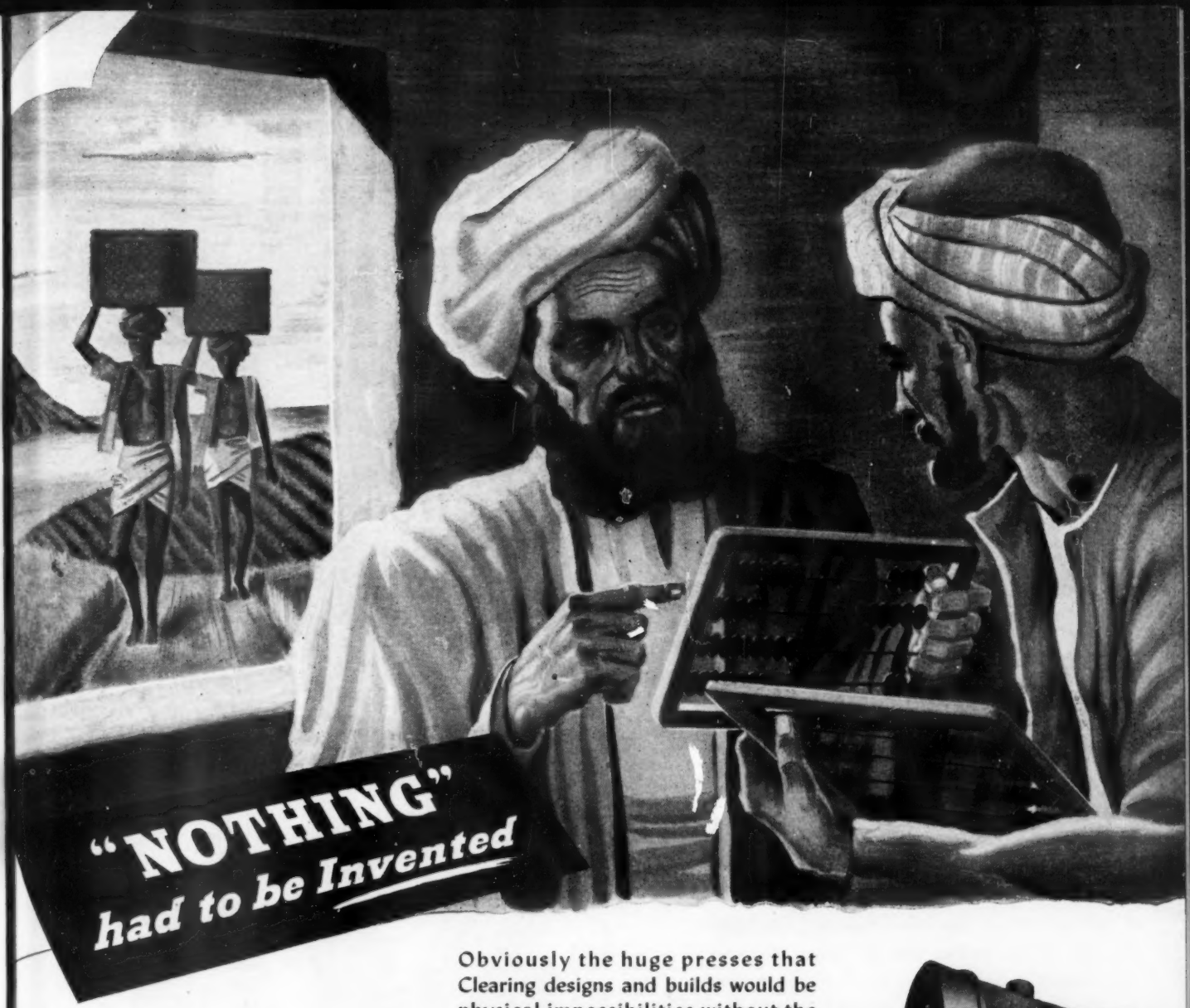


SPENCER BINOCULAR MICROSCOPE with 3-dimensional vision, reveals surface finish, imperfections, etc.



WILDER PROJECTOR for accurate measuring or comparing objects by means of a magnified shadow image.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.



"NOTHING" had to be Invented

Modern mathematical computations would be impossible without the symbol **O**, which permits us to indicate the position and hence the value of a digit. Mankind very early learned to make marks representing various numbers, but the concept of a mark to represent nothing at all—actually, an empty column in the counting frame—was a daring departure which opened a whole new world. To the vision and initiative of an unnamed Hindu, circa 100 B. C. we thus owe the ability to achieve present day engineering wonders.

Obviously the huge presses that Clearing designs and builds would be physical impossibilities without the assistance of exact mathematical reckoning. And today, as always, vision and initiative are still vital counterparts of constant progress.

That the men who build Clearing presses possess these qualities is evident by the presses they have built. Often it has been a Clearing Press that has provided the way for a faster and better production method. Therefore when you face a production problem that can or might be solved by a press, may we suggest that you come to Clearing.

CLEARING MACHINE CORPORATION
6499 W. 65th St. • Chicago, Illinois

CMC CLEARING

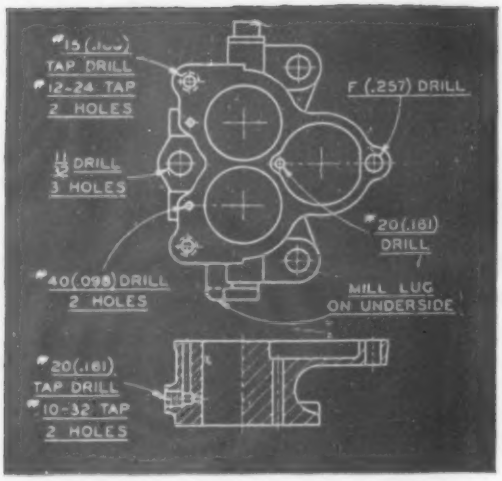
CLEARING PRESSES

MECHANICAL AND HYDRAULIC

FLEXIMATIC

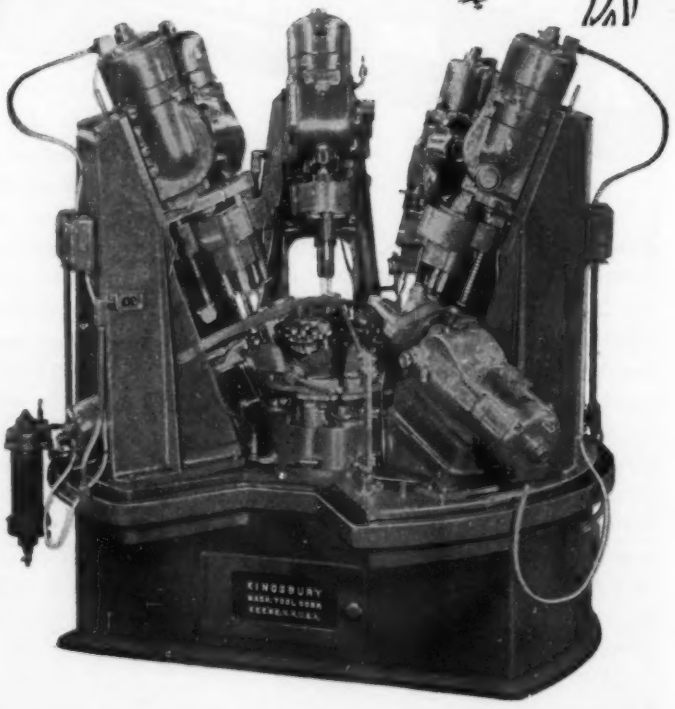
The THRIFTY Way

To Solve Production Problems



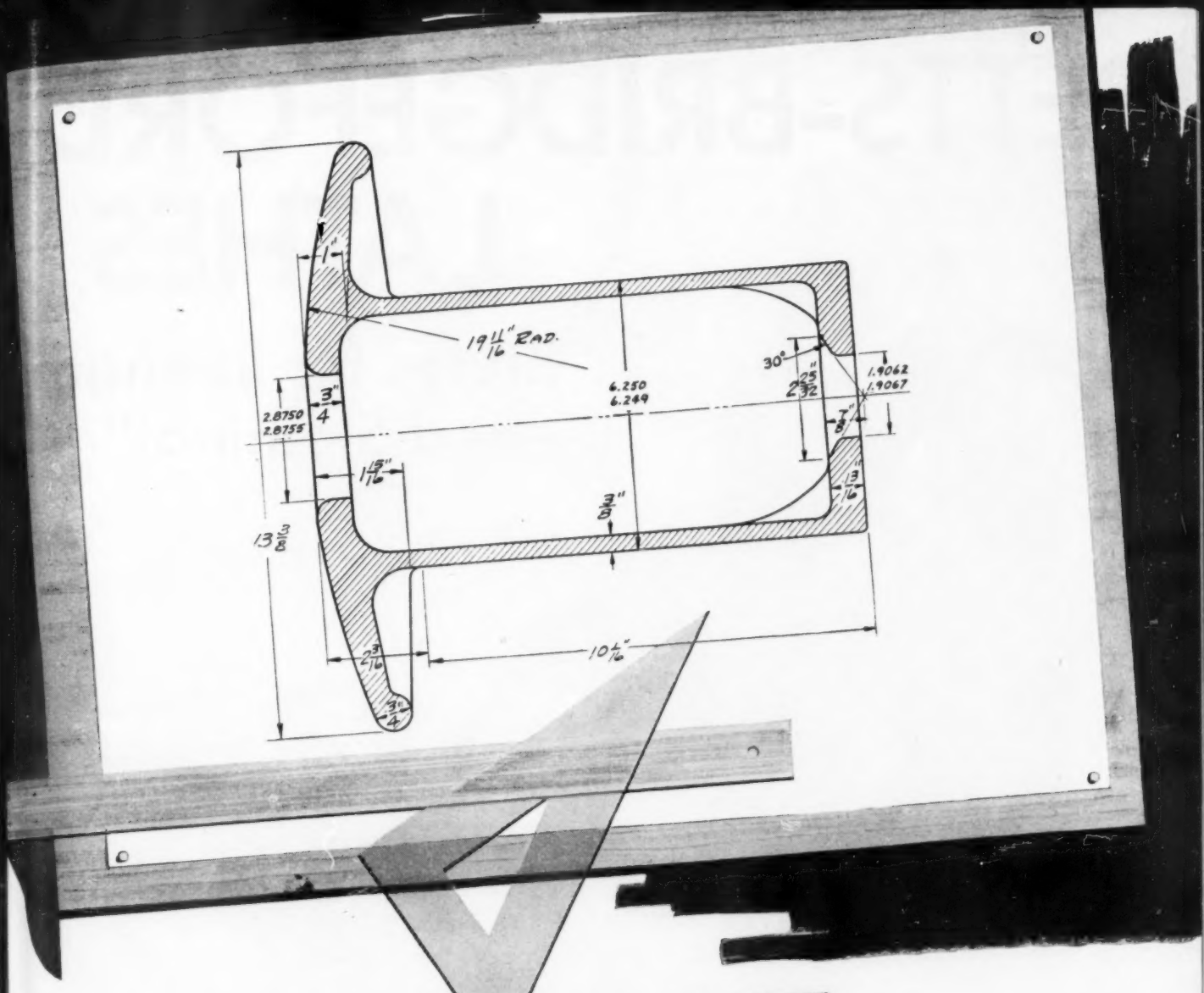
Over a dozen operations on the carburetor throttle valve bodies shown — and Kingsbury FLEXIMATICS perform the entire job in a single chucking of the work! An example of the thrifty way to solve multiple-operation production problems.

FLEXIMATICS are built up of standard Units, set up on a standard base around an automatically indexing work-holding turret. This unit system of construction keeps first costs low—out of the "special machine" class. And in addition, FLEXIMATIC Units can be changed, moved around and mounted in any combination on the base to meet the machining requirements of many different parts. That is why we say that **flexible automatic** FLEXIMATICS are the THRIFTY way to solve production problems.



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A



so far, so good—BUT...

Perfection on the drawing board won't determine the working life of a rotating part. Nor will superb machining . . . even to the closest limits of accuracy. There's still another factor to reckon with—*vibration*—the arch-enemy of high speed rotation. And it won't show up until the part is finished.

True static and dynamic balance are a *part* of design—the part that assures long life and quiet operation in a fine product. With the aid of Gisholt Dynetric Balancing Machines you can locate, measure, and correct unbalanced forces more quickly and accurately than ever before. Ask for literature on Dynetric Balancing.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • *Madison, Wisconsin*

LOOK AHEAD . . . KEEP AHEAD . . .
WITH GISHOLT IMPROVEMENTS

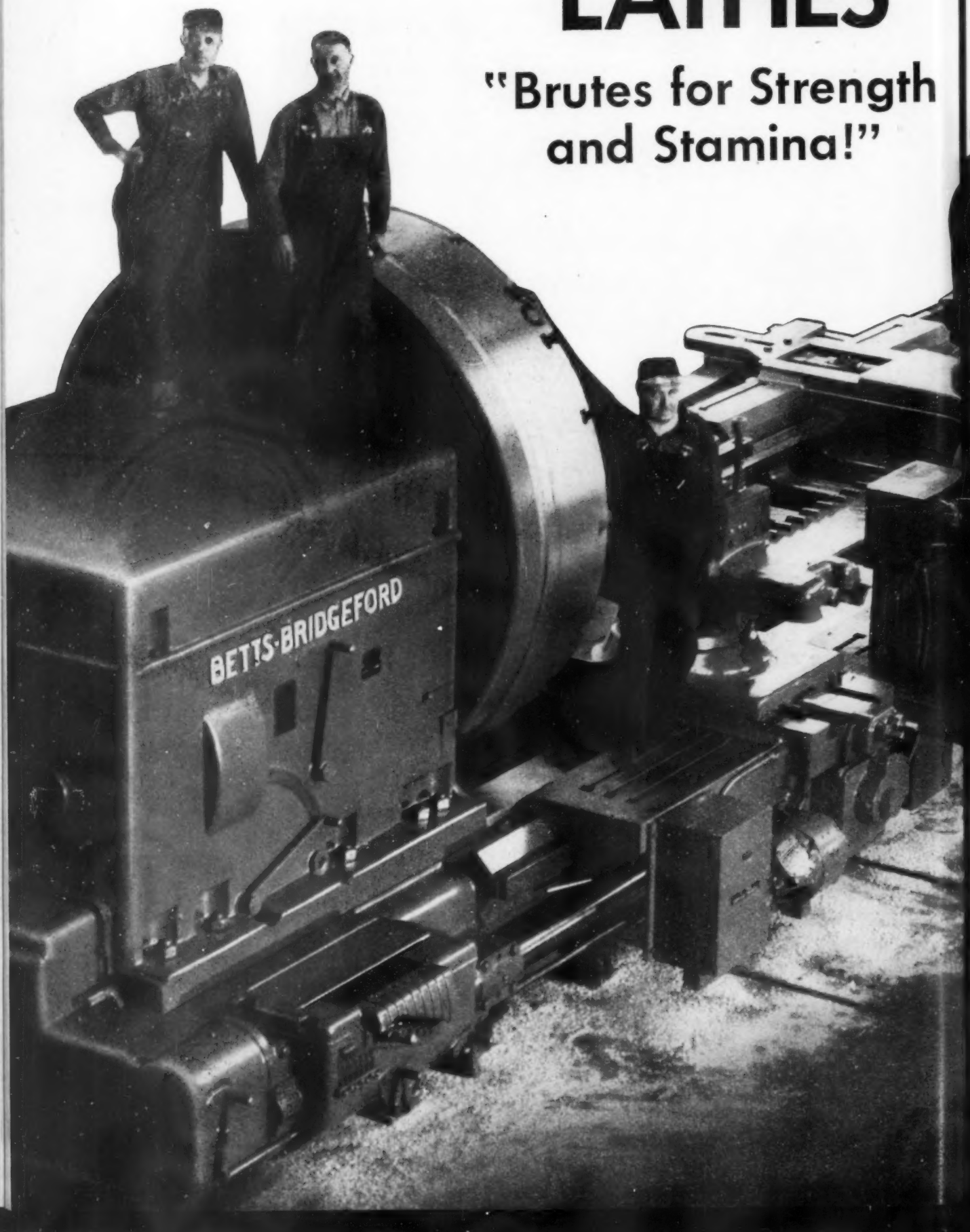
GISHOLT

BALANCING MACHINES

TURRET LATHES • AUTOMATIC LATHES •

BETTS-BRIDGEFORD LATHES

"Brutes for Strength and Stamina!"



TAKE a look at the Betts-Bridgeford Boring and Turning Lathe shown above. It will swing work 100 inches in diameter, takes 70 feet between centers and will bore 25 feet in length. Big, powerful and versatile, it is typical of all Betts-Bridgeford lathes. Capable of maintaining accuracy even under the most severe service throughout their long life, Betts-Bridgeford lathes are *brutes for strength and stamina.*

These lathes are built in sizes from 26 inches swing and up, the larger ones handling work 144 inches and more in diameter. We also build special-purpose lathes to meet practically any requirement. Send us your next lathe inquiry.

CONSOLIDATED

MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

PRODUCTION GRINDING

Simplified!

FLEXIBLE

Attach a Dumore Precision Grinder in any position to any machine tool—for external or internal grinding.

DURABLE

Exclusive design features and precision manufacture give Dumore the stamina for long hours of precision work.

ECONOMICAL

Equivalent investment will supply more grinding facilities in Dumore Precision Grinders than in any other way.

● When Scully-Jones & Company were called on for greatly increased production of precision cutters, reamers, drills and similar tools needed by their customers for war production, they faced a serious shortage of cylindrical grinding machines. The difficulty was solved by mounting some 24 Dumore Precision Grinders on various available bases, with only a small amount of rebuilding. Thus, at negligible cost, they provided a formidable battery of precision grinders sorely needed to augment their production facilities. Ingenuity triumphed and the resulting production of their grinding department is convincing evidence of the practical efficiency of Dumore Grinders.

Explore the full possibilities of the "Dumore System" in stepping up the precision—and the volume—of your products! Ask your distributor for full details—or write for complete catalog today!

THE DUMORE COMPANY, RACINE, WISCONSIN

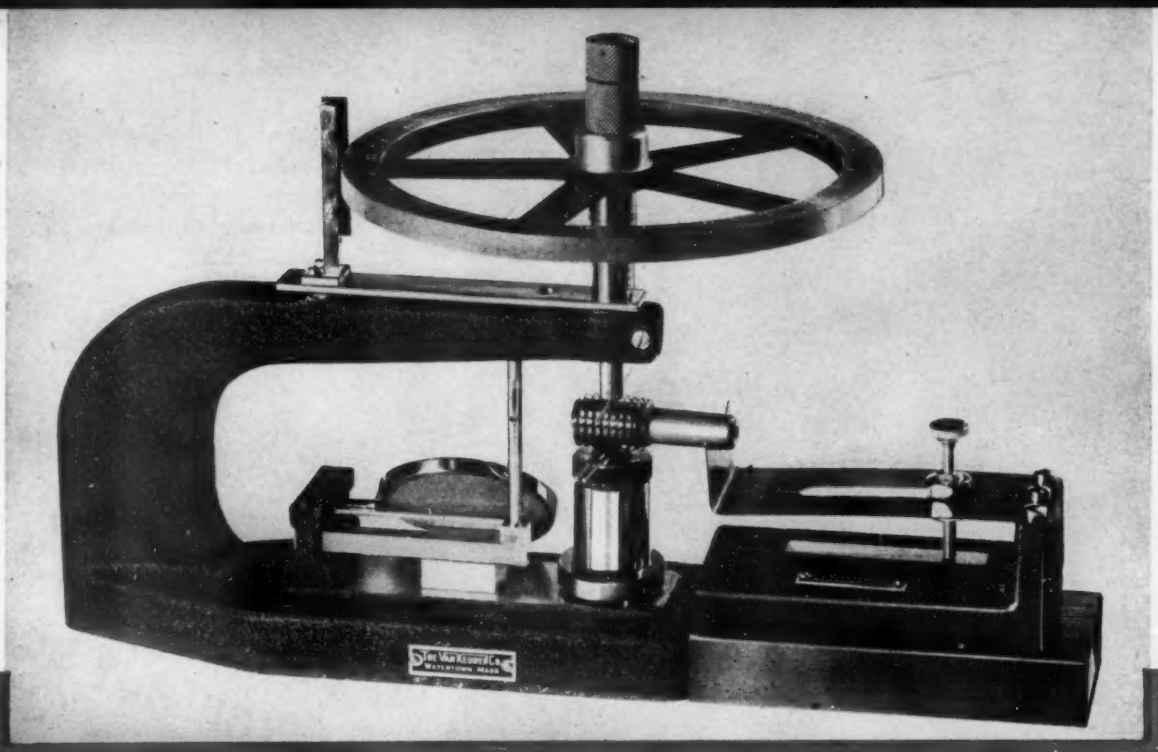
The Quill is the Heart of the Grinder!

Unique design features and manufacturing methods have made the Quill of the Dumore trouble-free and performance-perfect! Numerous plants are installing them as replacement units in existing grinders. Get Dumore catalog 42 for details!

Dumore

PRECISION GRINDERS

DUMORE PRECISION GRINDERS ARE SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES



Van Keuren LIGHT WAVE MICROMETER FOR SUSTAINED ACCURACY

● **New System of Accuracy** — The VK light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

● **Controlled Pressure Assures Uniformity** — By using the sensitivity of light waves the VK light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

● **Ideal for Shop Measurements** — The VK light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks —use the VK light wave micrometer. It is fast, accurate and profitable.

The VK Light Wave Micrometer is described in full in our manual of precision measuring equipment. This book also gives complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Write for your copy!

Van Keuren

THE Van Keuren CO., 24th YEAR 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages
Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

Twist Drills—Milling Cutters —Reamers—Hobs—Slittings Saws—End Mills—Taps—Dies —Screw Plates—Profile Cutters—

THE TOOLS YOU BUY AGAIN

EVERY SMALL TOOL JOB IS AN OPPORTUNITY FOR A SAVING

Completeness of the UNION line makes it possible to realize BIG SAVINGS on many operations. Milling, drilling, reaming, hobbing, slitting, tapping, threading, cutting can be speeded up and costs reduced by these modern, fast, accurate tools.

Cost minded production men know from experience that UNION tools can always be depended on for economy and increased cutting efficiency over long periods between grindings.

Because of the wide range of tools in the UNION line, with each tool designed for maximum results, standardization on UNION tools can mean an overall total saving of substantial proportions. Put UNION tools to work and see for yourself.

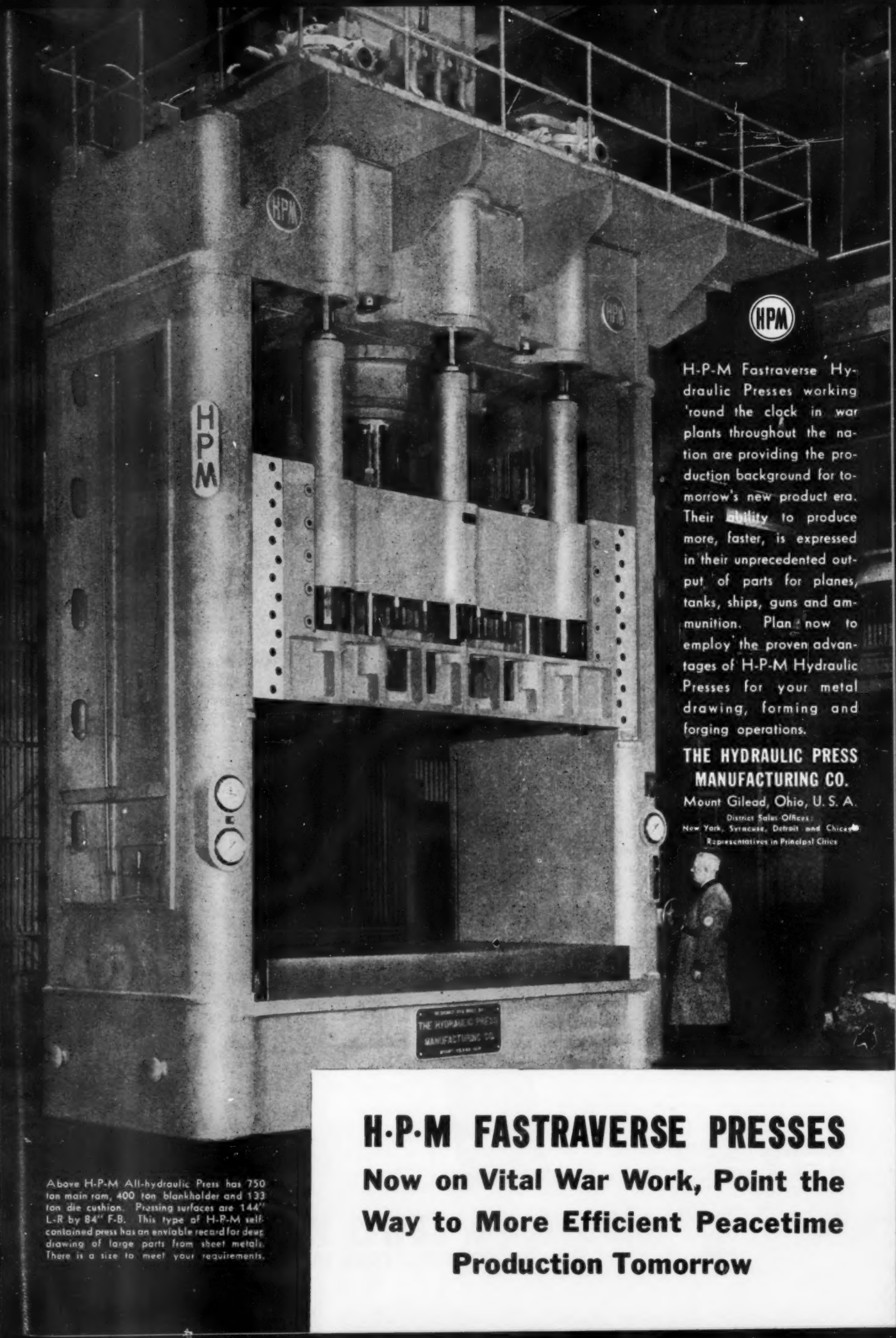
UNION
TWIST DRILL COMPANY
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

Representatives throughout the world

UNION



HPM

H-P-M Fastraverse Hydraulic Presses working 'round the clock in war plants throughout the nation are providing the production background for tomorrow's new product era. Their ability to produce more, faster, is expressed in their unprecedented output of parts for planes, tanks, ships, guns and ammunition. Plan now to employ the proven advantages of H-P-M Hydraulic Presses for your metal drawing, forming and forging operations.

THE HYDRAULIC PRESS MANUFACTURING CO.

Mount Gilead, Ohio, U. S. A.

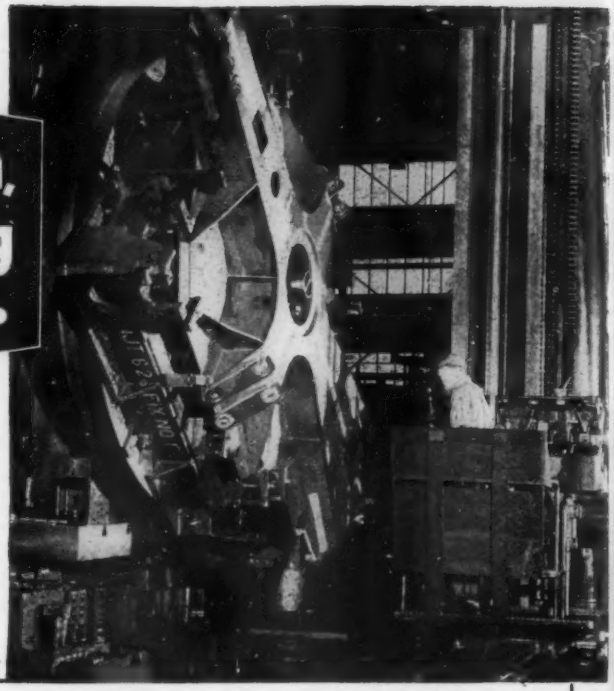
District Sales Offices:
New York, Syracuse, Detroit and Chicago
Representatives in Principal Cities

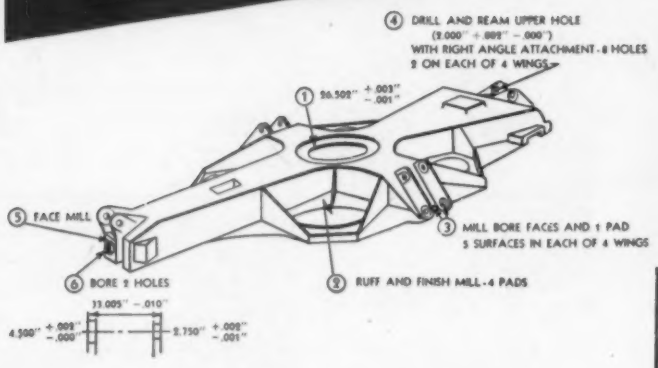
Above H-P-M All-hydraulic Press has 750 ton main ram, 400 ton blankholder and 133 ton die cushion. Pressing surfaces are 144" L-R by 84" F-B. This type of H-P-M self-contained press has an enviable record for deep drawing of large parts from sheet metals. There is a size to meet your requirements.

H·P·M FASTRAVERSE PRESSES

Now on Vital War Work, Point the Way to More Efficient Peacetime Production Tomorrow

How to Tool-up a Tough, Awkward Boring, Drilling and Milling Job . . . .




4 DRILL AND REAM UPPER HOLE
(2.000" +.002" −.000")
WITH RIGHT ANGLE ATTACHMENT - 8 HOLES
2 ON EACH OF 4 WINGS
1 36.502" +.003" −.001"
5 FACE MILL
3 MILL BORE FACES AND 1 PAD
5 SURFACES IN EACH OF 4 WINGS
6 BORE 2 HOLES
2 RUFF AND FINISH MILL - 4 PADS
13.005" −.010"
4.500" +.002" −.000"
2.750" +.002" −.001"

G & L Standard Floor-Type Machine Handles Large Weldment with Ease—Using Both Horizontal and Vertical Tables Simultaneously . . .

This Giddings & Lewis Floor-Type Horizontal Boring, Drilling and Milling Machine is provided with a combination table, which can be rotated both vertically and horizontally. The horizontal table is used for indexing only, while the vertical table utilizes both indexing and rotary power-feed. With this setup, the large steel weldment is easily machined in only one setting.

In addition to the rotary tables, a G & L Continuous Feed Facing and Boring Head and a right angle attachment are used to simplify the machining of this large, unwieldy part. See operation sequence at the right.

This is an excellent example of how a standard, general purpose G & L Horizontal Boring, Drilling and Milling Machine can be tooled up for production boring, drilling and milling in a single setup. Our engineers will be glad to work with you, either assisting in the selection of the best G & L Machine suited to your work, or studying and recommending tooling best fitted to your particular requirements.

Additional Data covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. 92.

SEQUENCE OF OPERATIONS

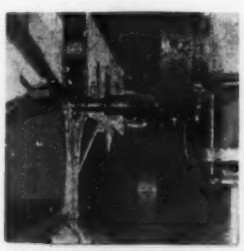
Operation 1; rough milling with power rotary feed.

Operation 1
Load weldment. Rough mill surface No. 1 with headstock stationary, while weldment is rotated by the vertical table.

Operation 2
Rough and finish face mill 4 pads numbered 2 on drawing.

Operation 3
Finish face surface No. 1 with single point tool and Continuous Feed Facing Head.

Operation 4
Use combination end mill and helical cutter. Slabmill surfaces numbered 3 on drawing. These surfaces are the four bosses of the wings in each of four arms plus a pad between each pair of wings which is end milled in same setup.



Operation 2, finish facing with continuous feed facing head.

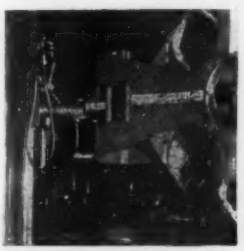
Operation 5
Use right angle attachment. Drill and ream holes numbered 4 on drawing—eight holes, two in each wing.

Index Weldment

The vertical table is indexed so that surface No. 5 is vertical to the floor plate. The horizontal table is then indexed 90° to present surface No. 5 to the spindle.

Operation 6
Face mill surface No. 5.

Operation 7
Bore two holes No. 6, two cuts, rough and finish. First bore is 4.500″+.002″−.000″. Second bore is 2.750″+.002″−.001″.



Operation 4, milling pads with helical end mill.

GIDDINGS & LEWIS MACHINE TOOL CO.

138 DOTY ST., FOND DU LAC, WISCONSIN

A CLOSE EYE *for Tolerances* AND A QUICK FINGER *on Control*

THOMPSON GRINDERS

Built in a complete range of types and sizes for wide application. Largest Type C 36" x 36" x 240".

● The sturdy, rugged construction and absolute freedom from vibration makes it easy for women operators to maintain rigid tolerances and obtain exceptionally smooth finishes on a Thompson Grinder.

The full hydraulic control of feeds — speeds — and rapid traverse provides unusual ease of operation -- exceptional accuracy — and high productive capacity.

The young lady operating this Thompson Type B Grinder at Goodyear Aircraft finds it quite easy to meet specified tolerances and also makes a good showing on production.

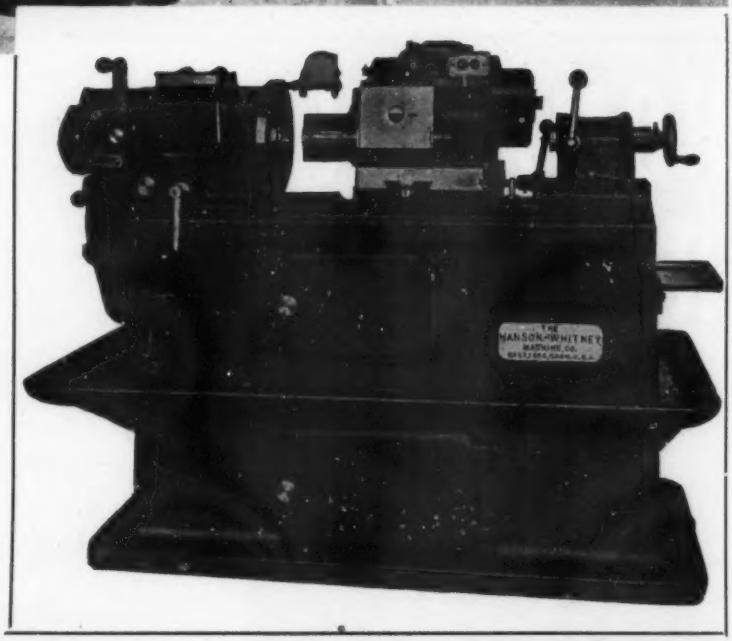
Thompson Grinders will help you on your precision grinding operations.

THE **Thompson** GRINDER CO.

SPRINGFIELD OHIO

Death Dealing

Production is today LITERALLY a matter of life or death. H-W Semi-Automatic Thread Milling Machines are winning production victories . . . by saving precious time in thread production . . . by minimizing spoilage . . . by securing highest precision on difficult work. The H-W Milling Process employs multiple cutters that finish threads in one revolution . . . producing internal, external or taper threads . . . right or left hand . . . with equal speed, facility and precision. If you have a threading problem, write or wire . . .

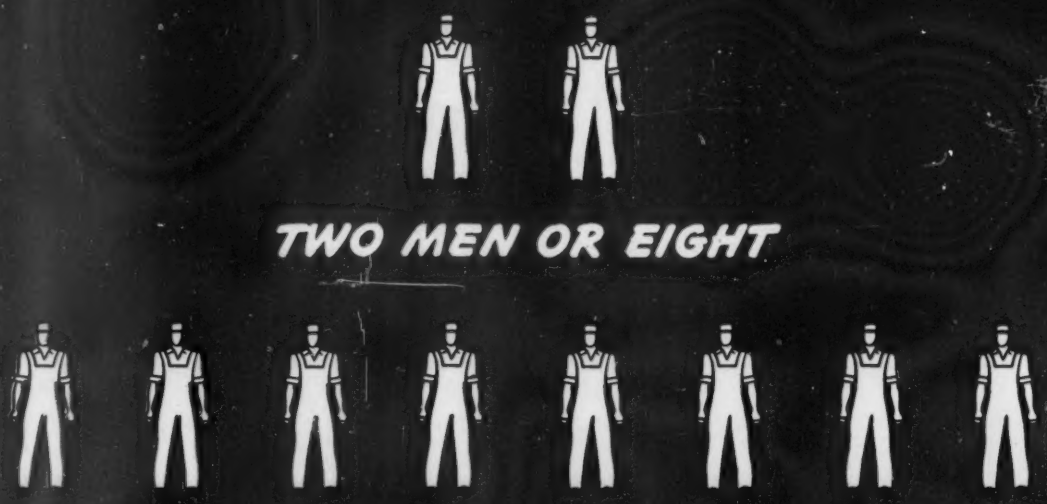


ARMY E NAVY

THE HANSON WHITNEY MACHINE CO.

HARTFORD CONNECTICUT U.S.A

The *Alrok Finish* for aluminum may relieve production bottlenecks



Alcoa-research developed the Alrok* finish for use on aluminum surfaces that are to be painted. It has proved completely adequate for many parts. It is quite possible that this chemically-applied finish can be satisfactorily substituted in many places where the more expensive, time-consuming electrolytic finishes are now specified.

Note the savings possible where the Alrok finish is employed: In one plant, two men finish 800 pounds of small parts per hour by the Alrok process, and 100% inspection is not necessary. It takes eight men to finish the same quantity of parts by the electrolytic process.

Bear in mind that, for the use made of these parts, both jobs are equally acceptable. Only one fourth the number of men, and no electrical generators, are required for the latter finishing job. The Alrok finish certainly deserves consideration for many parts on which the electrolytic finish is now specified.

There's an approved Government specification covering the Alrok finish for certain purposes. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh, Pa.

*Patented process

ALCOA ALUMINUM

Orders for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES

This big Ohio Horizontal handled all the boring, drilling and milling operations on a 22000-pound cast steel base for a power shovel. Performance was accurate, speedy and completely satisfactory.

Ohio's portable control (which can be ordered for the machine shown above) is a demonstrated time-saver, simplifying and speeding up many an otherwise unprofitable job. The power, precision and convenience traditional in Ohio Dreadnaughts are promoted by such features as these: unit construction, nitrided spindle, anti-friction bearings, built-in electrical power rapid traverse, narrow guide construction for all moving parts, push-button control for start-stop, forward-reverse and run-jog of the spindle, continuous spindle feed of 72" with full-length spindle support, internal gear-tooth type clutches, automatic lubrication, multiple-splined shafts with splines milled from the solid for all sliding gears and clutches.

Heavy duty and extra heavy duty models, floor and table types, 5" and 6" spindle sizes. Full range of accessories. Ask for Bulletin 300.

THE OHIO MACHINE TOOL COMPANY • KENTON, OHIO

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

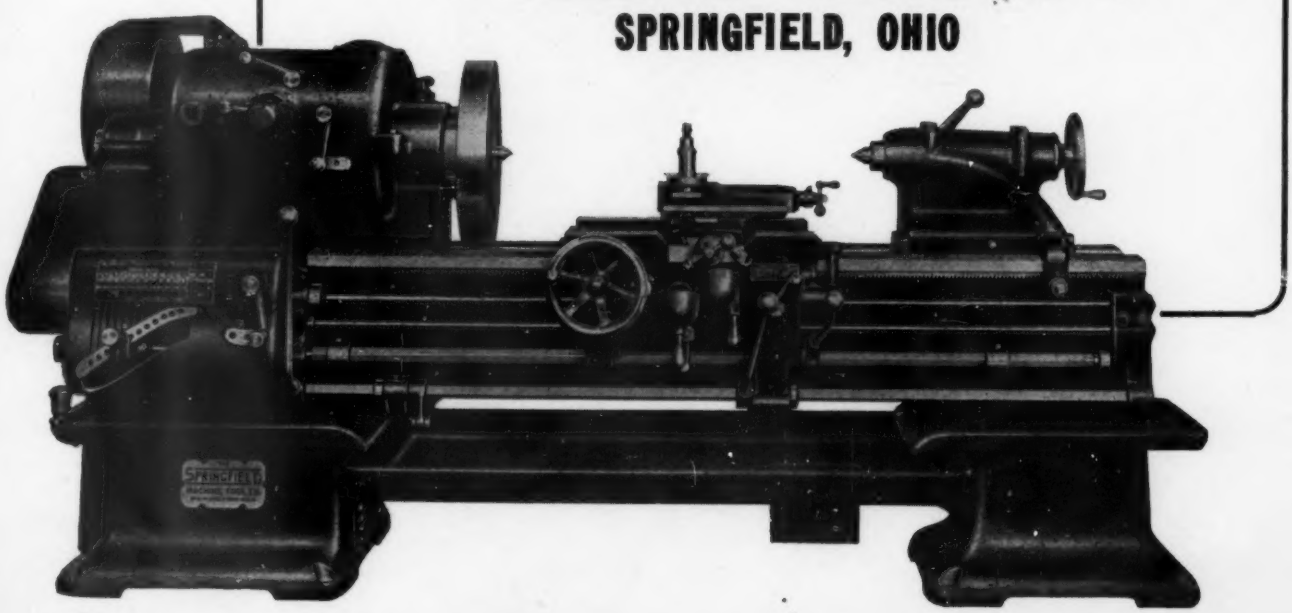
MUNITIONS MANUFACTURERS

...LOOK TO SPRINGFIELD PRECISION LATHES!

. . . here is a lathe which is truly modern from headstock to tailstock. Features which are especially timely, mark it as an outstanding value for both tool room and quantity production use. Primary among these features—one that assures accuracy, and therefore is of great importance to munitions manufacturers—is MATERIALS.

Springfield Lathe beds are made in our own foundry—of highest nickel-chrome gray iron—an operation that enables us to *guarantee* strength and wear-resisting qualities . . . allows us to follow through on each casting operation . . . makes *certain* every rigid standard we specify. Springfield iron itself, too, is especially resistant to warping and marring, even under severest service. Here, then, are factors that account for the sustaining, over long periods of use, of the original accuracies built into every Springfield Lathe.

The SPRINGFIELD MACHINE TOOL Co.
SPRINGFIELD, OHIO



Retooling especially for munitions manufacturers, should take into consideration (1) extreme ACCURACY and (2) maintenance of such accuracy. In other words, LONG LIFE And the Springfield Lathe delivers both!

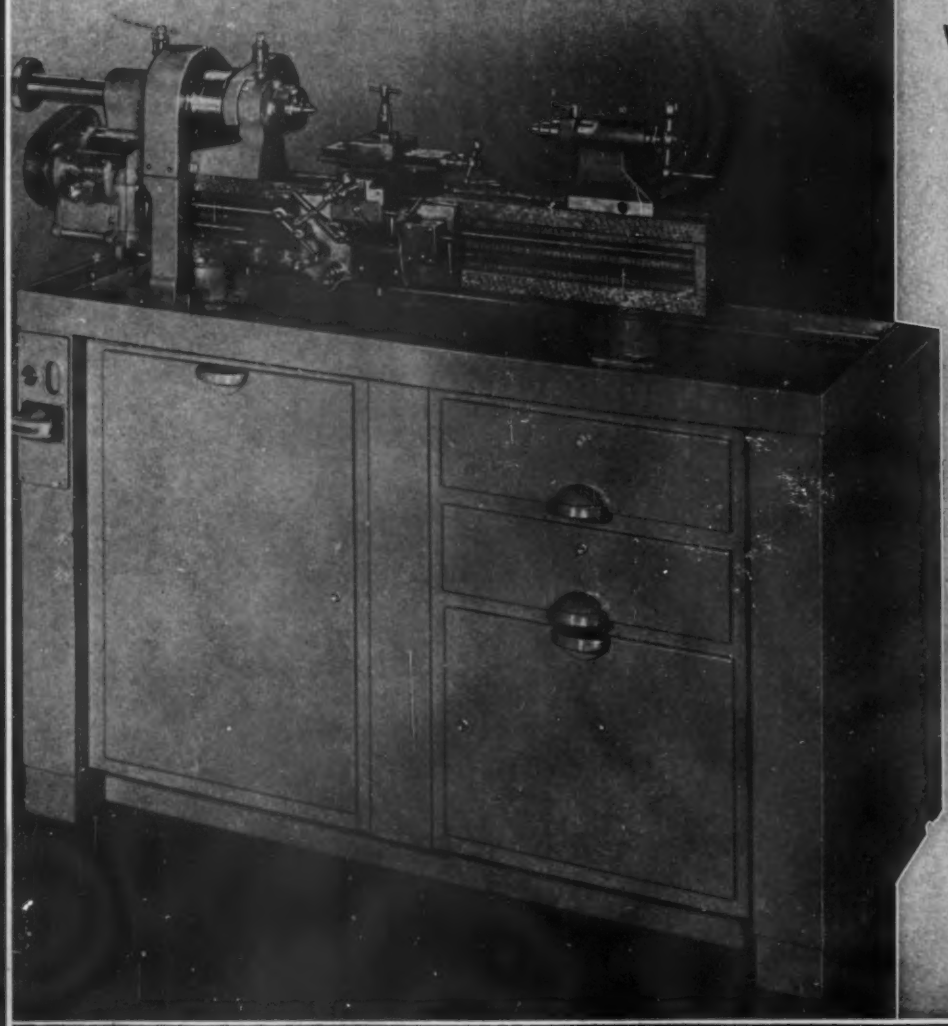
RIVETT

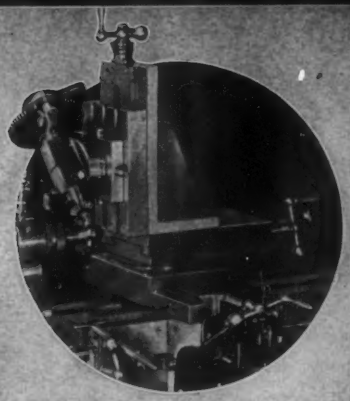
608 WITH VEE BELT DRIVE

In Tool-Making and Instrument Shops It Will Handle Great Variety of Jobs in Minimum Time

The Rivett No. 608 is a super-precision, back-geared screw-cutting bench lathe designed for fine manufacturing, repair and experimental work. In tool-making and instrument shops it will handle a great variety of jobs to the closest precision limits.

Finely made attachments for [illegible] cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations enable the fully equipped No. 608 to finish his work completely without recourse to other machines, and throughout his entire series of operations to utilize the inherent precision of the lathe itself.





Milling

Multiple Operations

SPECIFICATIONS

With Flat or Vee Belt Drive

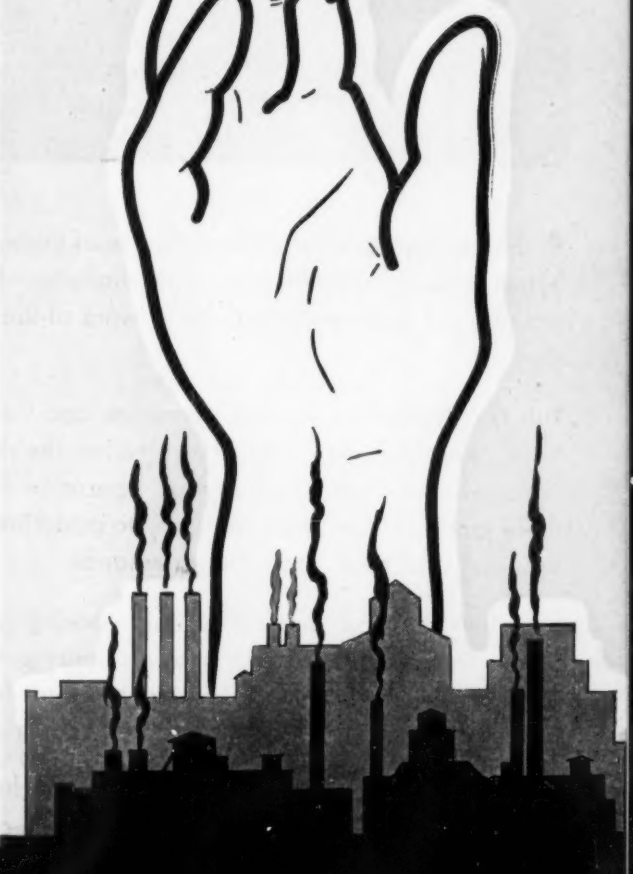
Swing over bed, dia.	8½"
Length of bed	40"
Distance between centers	18¼"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of top slide	5¼"
Slide rest, travel of cross slide	4½"
Feed range, through gear box	.0015" to .0220"
Thread range, through gear box	10 to 144
Tailstock spindle travel	3¼"
Spindle speeds:	
Flat belt drive—12 speeds	39 to 1295 r.p.m.
Vee belt drive—12 speeds	25 to 1500 r.p.m.
Weight of lathe, mounting and drive:	
Flat belt drive, net	900 lbs.
Vee belt drive, net	1050 lbs.

For Further Description Write for Bulletin 608

RIVETT LATHE & GRINDER INC.

Precision GAGES

HELPING INDUSTRY MAINTAIN ACCURACY



- ★ STANDARD THREAD GAGES IN STOCK
- ★ PLUG AND RING GAGES MADE TO A G D STANDARDS
- ★ SPECIAL GAGES MADE TO YOUR PRINTS

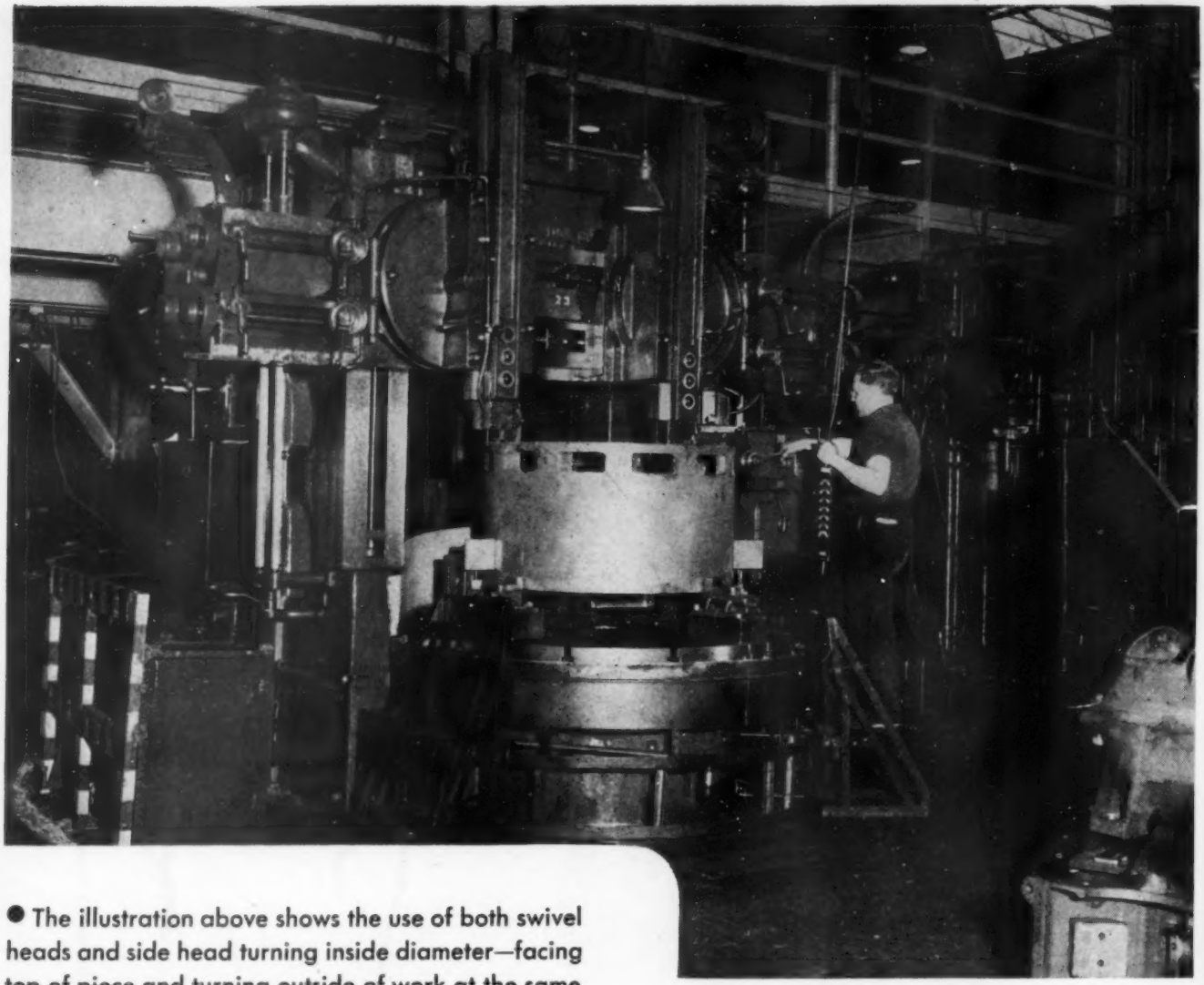
Write Today for Complete Information

METRO

TOOL AND GAGE CO.

4240 PETERSON AVE.

CHICAGO, ILL.



● The illustration above shows the use of both swivel heads and side head turning inside diameter—facing top of piece and turning outside of work at the same time.

This is a typical boring mill operation and the King Vertical Boring and Turning Machine has the rigidity—ruggedness—and simplicity of operation to do these jobs well—maintain accuracy to prescribed tolerances—and meet production demands.

Whether your job requires turning—boring—facing or any combination of similar operations—put it on a King Vertical Boring & Turning Machine for the utmost in accuracy and dependable production.

King builds Vertical Boring and Turning Machines in single column types from 30" to 42"—double column types up to 10 feet.

WHERE
THREE HEADS ARE BETTER THAN ONE

KING
VERTICAL BORING & TURNING MACHINE

The KING MACHINE TOOL *Company*
BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY
CINCINNATI, OHIO

FIRTHITE

SINTERED CARBIDES

Increases...280%... 290%...300%...and over! New production records are chalked up day after day as the use of FIRTHITE Cutting Tools spreads through a shop—for turning, boring, facing, milling, reaming.

FIRTHITE Sintered Carbides cut metals and non-metallic materials at higher speeds, faster feeds. FIRTHITE Engineers are at your service.

ARMY E NAVY

Firth-Sterling

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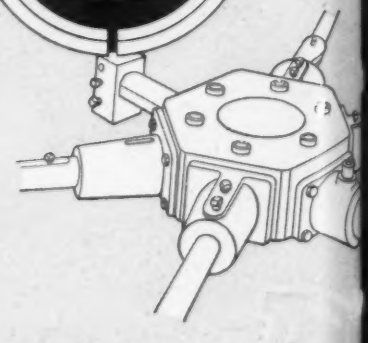
Offices: McKEESPORT, PA. · NEW YORK · HARTFORD · CLEVELAND · DETROIT · CHICAGO · LOS ANGELES

THAT'S NO WAY TO BEAT THE AXIS, SON!

GISHOLT



NEVER CLEAN A MACHINE WITH AN AIR HOSE! Strong blasts of air can blow fine chips and dirt into small clearance openings and bearings where they may lodge and cause serious failures.

★ *Reprints of this page on enameled paper are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1201 East Washington Avenue, Madison, Wisconsin. Ask for the series of "War-Time Care and Operation Posters."*

VERSATILITY

FOR CONTINUOUS HIGH PRODUCTION WORK

FOR SHORT RUN, SMALL LOT ASSIGNMENTS

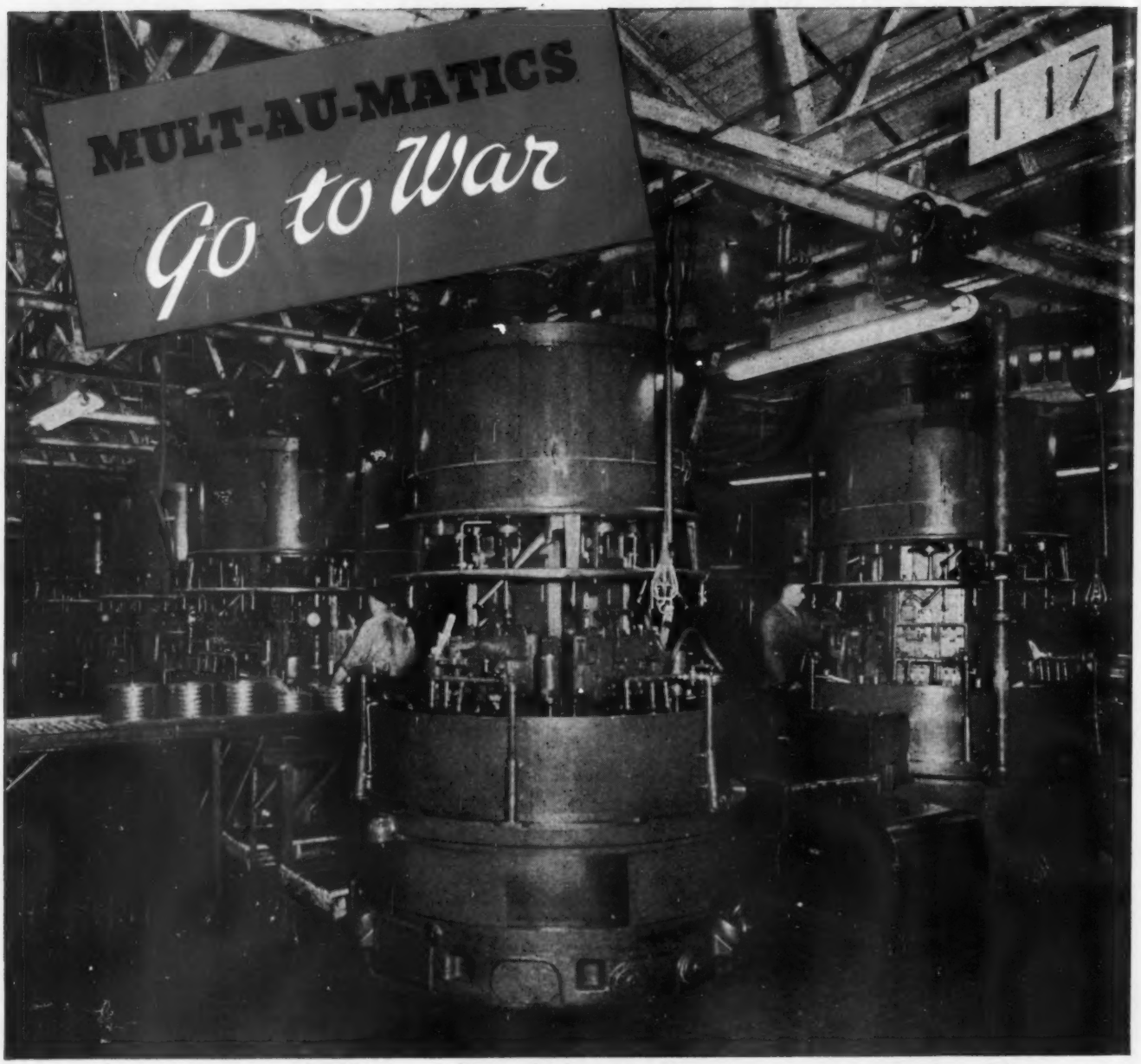
● Versatility to handle changing wartime requirements is an outstanding characteristic of the Model 40.

This thread miller, ideally suited for continuous, gruelling high production work such as that illustrated, can, when desired, be used to equal advantage on short run, small lot assignments. Versatility—made possible because the design of the Model 40 is such that it can be changed over from one assignment to another with ease and speed.

Why not investigate the advantages of the Model 40 Thread Milling Machine applied to your precision threading requirements?

The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



America's great automobile makers are doing many kinds of war work since Pearl Harbor. But in many cases they are still using the same batteries of faithful Mult-Au-Matics that have served them well in the peace-time years.

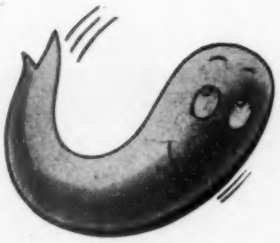
The automobile men had less to learn about the Mult-Au-Matics than did some other industries. They already knew the Mult-Au-Matic speed, economy, precision, and versatility. They now realize more fully how quickly the Mult-Au-Matic can apply these benefits to radically different wartime jobs. They will put this versatility to good advantage when Victory is ours and peace returns.

The Bullard Company

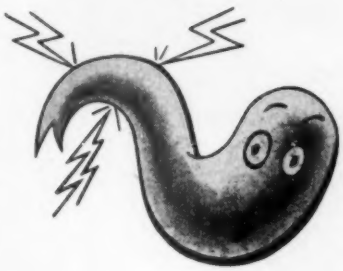
BRIDGEPORT 2, CONNECTICUT

HOW *PRECIPITRON*★ WORKS

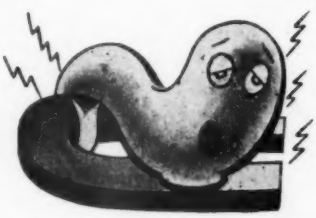
Here's the inside story of *Electric* Air Cleaning



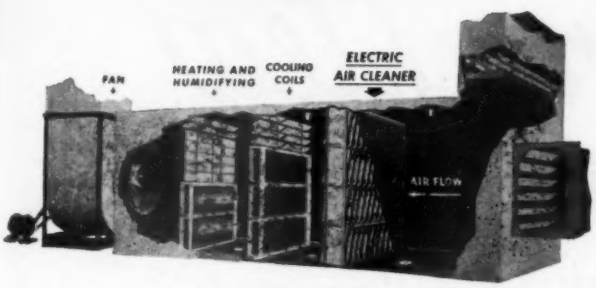
There is really nothing mysterious about Precipitron—the new Westinghouse air cleaner that operates by electricity. Yet it whisks smoke, haze, dust and dirt out of the circulating air as if by magic. In fact, it removes 90% of all particles down to 1/250,000 of an inch in diameter. Even *tobacco smoke,* smallest and most elusive of all air-borne invaders, is quickly "grounded" upon contact with the Precipitron.



Sealed within the ventilating duct so that all air must pass through it, the Precipitron operates silently, efficiently, with no more moving parts than a storage battery. At the front of the unit (or cell), two fine tungsten wires and three grounded rods create a strong electrostatic field. As each particle of dust or smoke passes through this field, it receives a positive charge of electricity, making it a "willing victim" for the next step in the process.



A series of collector plates are located back of the electrostatic field and as the charged particles pass through, they are drawn to the oppositely charged plates where they are deposited and adhere. At regular intervals these plates are cleaned with water and the deposit flushed harmlessly down the drain.



Cross section of typical air conditioning duct.

Today, Precipitron Electric Air Cleaning protects precision parts from air-borne grit and dirt . . . cleans ventilating air for large rotating machinery in steel mills and power stations . . . removes oil mist and welding fumes . . . performs many other important jobs for America's War Industries. For full information on Precipitron and its applications, write Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio

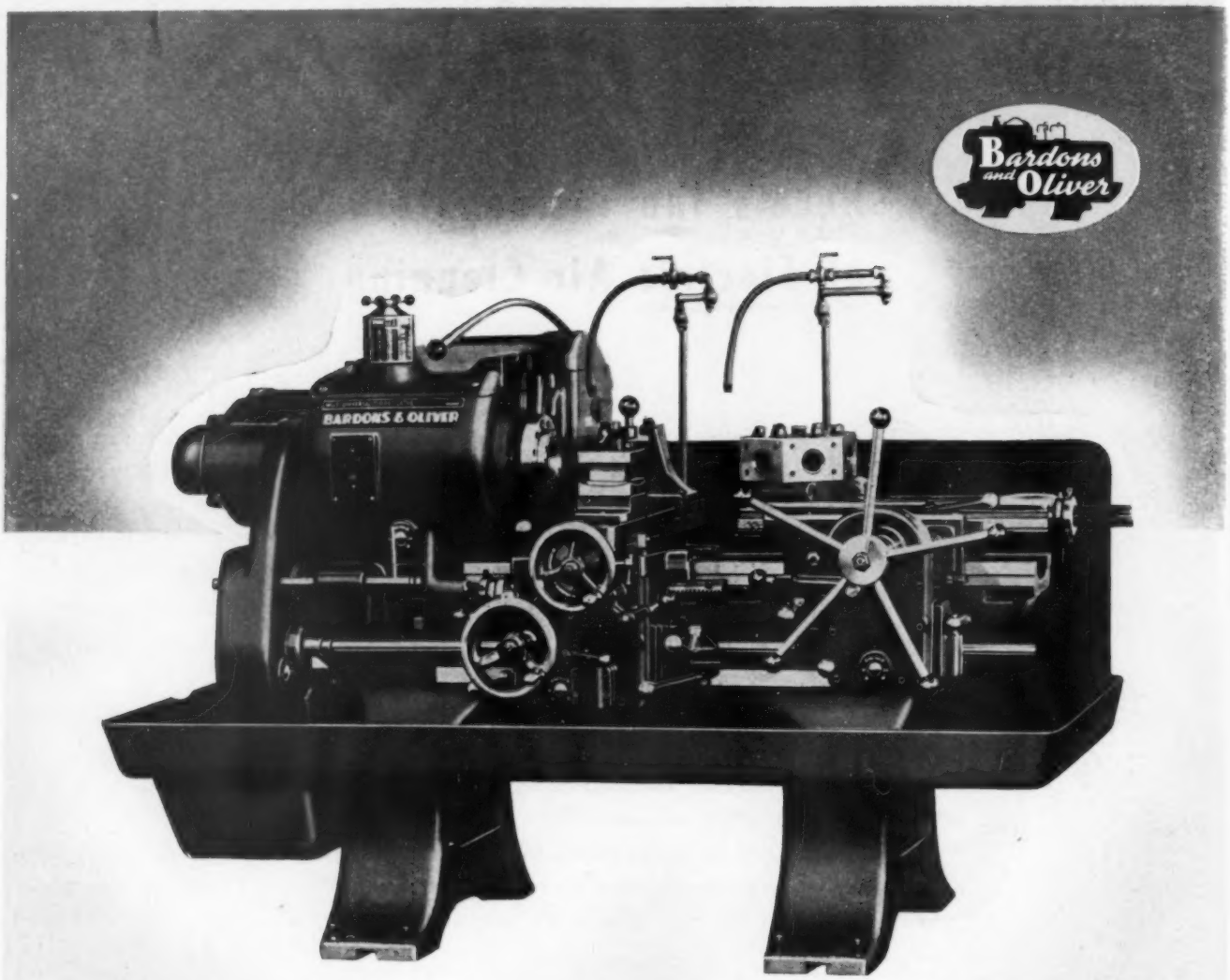
*Trade-mark registered in U. S. A.

Westinghouse Precipitron

PLANTS IN 25 CITIES ○ OFFICES EVERYWHERE

Tune in on John Charles Thomas, Sundays, 2:30 p.m., E.W.T.

Electronics at Work



Something New

HAS BEEN ADDED

MANY RECENT IMPROVEMENTS have been made in Bardons & Oliver Turret Lathes . . . Ask our representative to give you all the details . . .

BARDONS & OLIVER, INC. 1133 W. 9th STREET CLEVELAND, OHIO

THAT'S THE RECORD SET BY A
MID-WEST "B" BOND GRINDING WHEEL
OF THE TYPE PICTURED HERE

The "38 hour" wheel is a MID-WEST "B" BOND WHEEL, Type 5, 7.80, JB5, sized 10 x 2 x 2 and recessed on one side. It was installed on an Ex-Cell-O dry grinder by a large munitions plant in New Jersey and was being used to sharpen cemented carbide tool tips.

In a report submitted to the MID-WEST ABRASIVE COMPANY, engineers of the New Jersey plant said:

"This wheel lasted for 38 hours of continuous grinding. Best wheel ever used on this job. The wheel held its shape and required considerably less dressing."

For faster, more efficient carbide tool grinding order MID-WEST "B" Bond wheels today!

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE DETROIT 11, MICH.

Simplicity

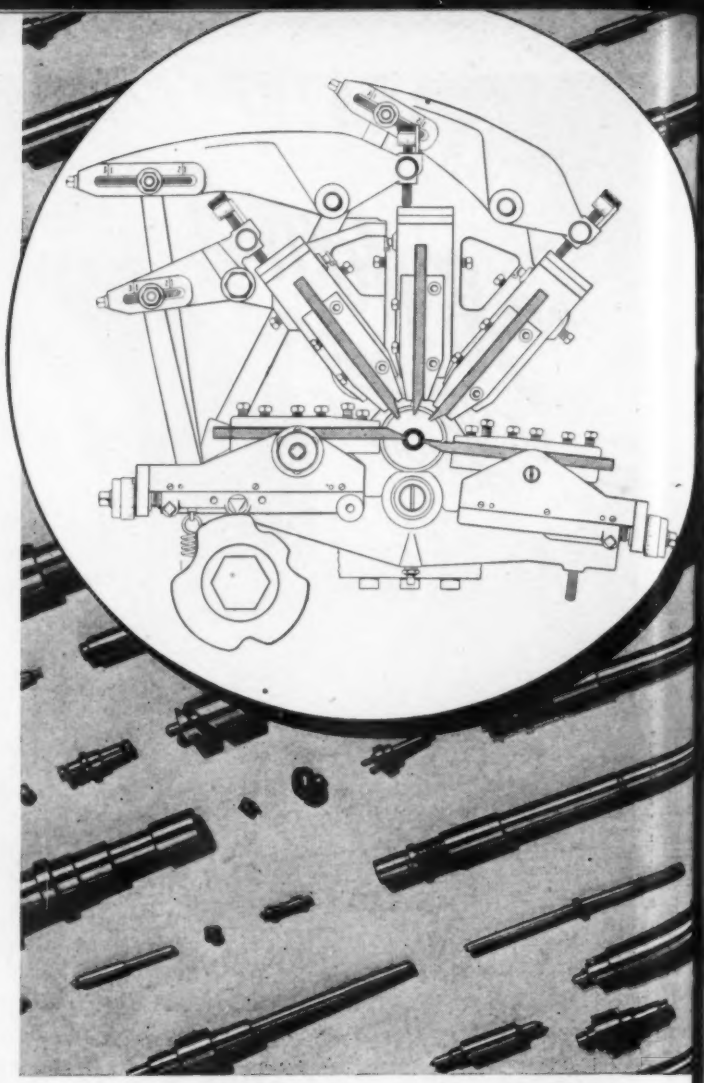
OF SET-UPS
OF ADJUSTMENTS
OF OPERATION

ALL VITAL PARTS AND CONTROLS INSTANTLY ACCESSIBLE ON

GORTON 16-A
PRECISION AUTOMATIC

The Gorton 16-A requires only the simplest single-point tool bits for the production of the most complex precision parts. Unique Gorton operating method insures extreme accuracy with exceptionally high finish; subsequent finishing operations are usually unnecessary.

Maximum accessibility of all five tool slides, tools, micrometer adjustments and all cams insures simple, quick, low-cost set-ups. Centralized fingertip controls provide infinitely variable spindle speeds (1100 to 10,000 r.p.m.) and infinitely variable cam feeds (20 to 720 pieces per hour; 20 to 1440 optional). *No speed or feed gears to change.*



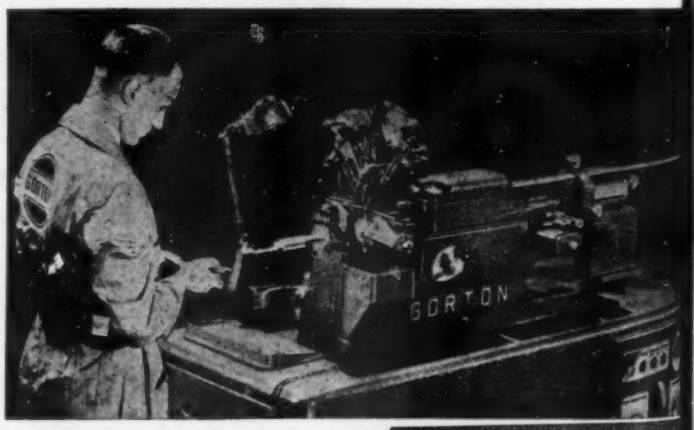
WIDE RANGE OF WORK
TURNS ANY DIAMETER from .005" to 7/16" Bar Capacity of Machine

PRECISION PARTS COMPLETE IN *1* OPERATION

The Gorton 16-A produces an almost endless variety of short or long slender parts—complete in *one* operation. It does step and contour turning and chamfering in multiple diameters...it centers, drills, threads, slots...it tapers, knurls, back recesses, pivot points, etc.

In achieving new advances in accurate, high speed, automatic screw machine production, the Gorton 16-A assures you of maximum efficiency in meeting the vital needs of today and those of the postwar period.

GEORGE GORTON MACHINE CO.
1315 Racine Street, Racine, Wisconsin, U.S.A.



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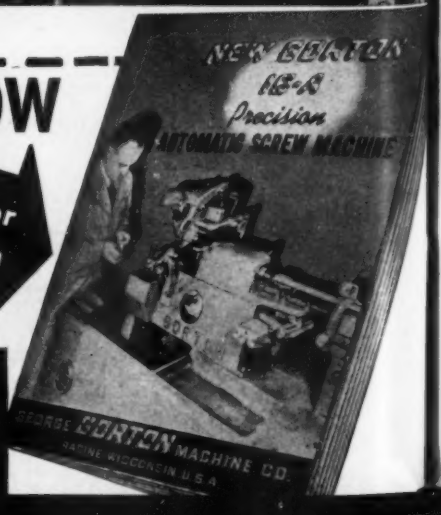
893-1943

GEORGE GORTON MACHINE CO.
1315 Racine St., Racine, Wis.
Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name..... *Title*.....
Company.....
Address.....
City..... *State*.....

GET THE FACTS NOW

Mail Today for FREE Bulletin



GORTON
30 YEARS OF PRECISION TOOLS

GEORGE GORTON MACHINE CO.

1315 RACINE STREET, RACINE, WISCONSIN, U. S. A.

SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES.

HERE'S NEW Double-Trouble for V-Belt Wear!

1

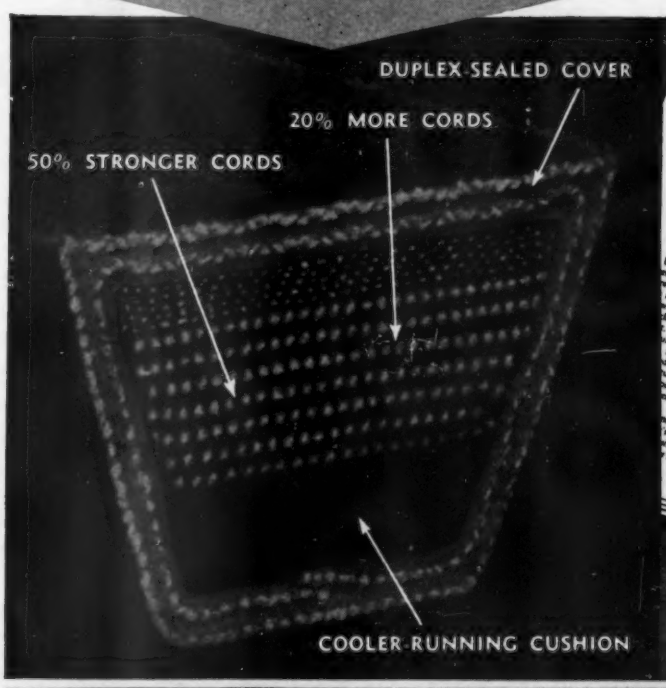
BUY THE BEST BELTS:

You'll get the "jump" on maintenance with Texrope Super-7's design-against-wear construction! 20% *more* pulling cords. 50% *greater strength* in every one because they're made by the special Flexon process. That adds up to extra pulling power, less stretch. A cool-running rubber cushion fights flexing heat. Tough Duplex-Sealed cover seals belt against grit, grime, and moisture. When you *do* need new belts *invest in the best* — Texrope Super 7!

2

USE THE BEST CARE:

Over 75,000 men in industry are getting a head start on longer V-Belt life because they've got Allis-Chalmers' new handbook: "Plain Facts on Wartime Care of Rubber V-Belts." It gives you the inside story on "how V-belt anatomy affects maintenance"... "good-rule-of-thumb for tension"... a lot of other tips. Excellent for training new men, it's packed with valuable data. For your *free* copy, tear off the coupon and send today.



TEXT FOR MULTIPLE V-BELT CARE...

Parable of the Sticks

TWO SOURCES OF UNEVEN V-BELT WEAR

ALLIS-CHALMERS

TEXROPE* SUPER-7 V-BELTS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

*Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by Allis-Chalmers. Available in all sizes.

ALLIS-CHALMERS MFG. CO.
Milwaukee, Wisconsin

Gentlemen:

Yes, I would like to receive free of charge a copy of your "Plain Facts on Wartime Care of V-Belts".

(Name)

(Title)

(Company)

(Street Address)

(City and State)

A 1628-3

"Cincinnati Boring Mills and Planers are the Backbone of our Output."

. . . One of America's largest manufacturers of gun-mounts told us in an unsolicited compliment to Hypro-duction machines in his large Mid-Western plant.

He went on to say, "We all appreciate your complete cooperation in our struggle to equip this plant."

• • •

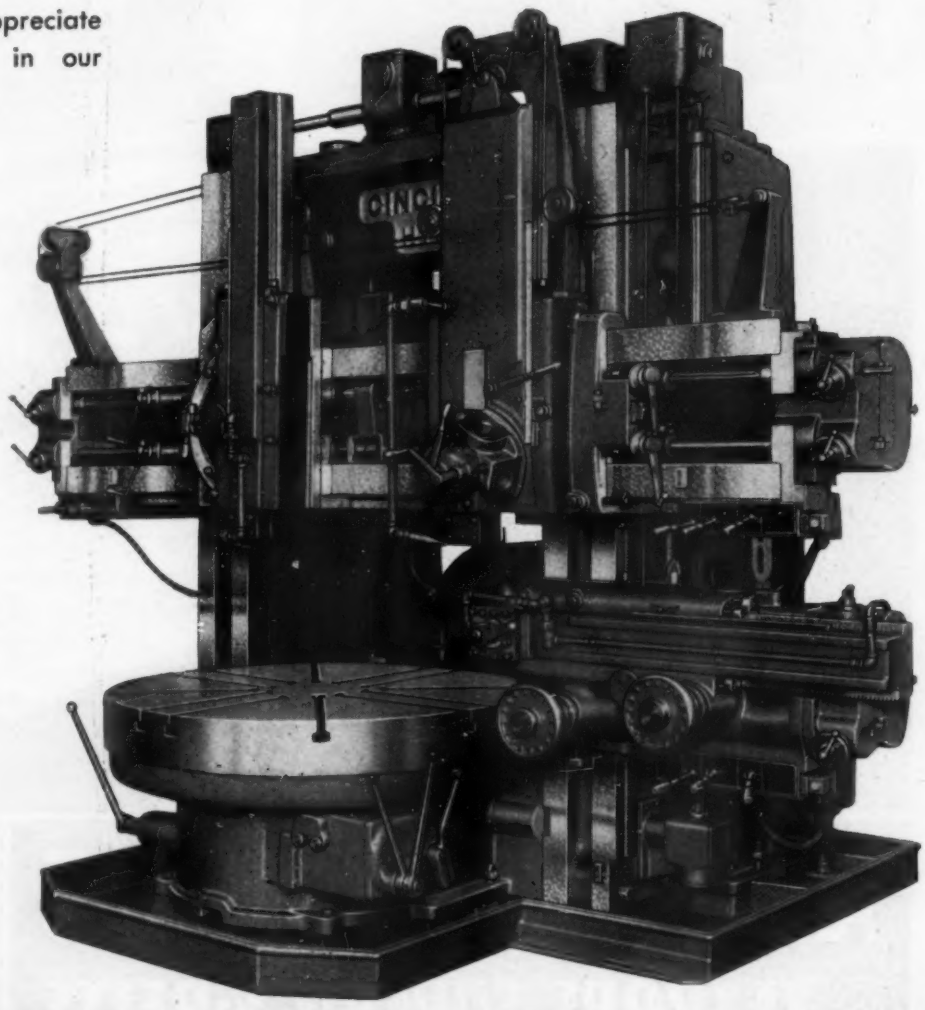
—And now you can enjoy even faster cooperation than we were able to give this gun-mount manufacturer. We can now offer the CINCINNATI HYPRO VERTICAL BORING MILLS of all sizes on very attractive deliveries.

THE CINCINNATI HYPRO 54" VERTICAL BORING MILL

illustrated includes all the latest unexcelled Hypro features

All Cincinnati Hypro Machine Tools are designed for

- RIGIDITY
- ACCURACY
- SPEED
- LOW COST



THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

DO YOU KNOW THAT...THERE'S A BETTER ANSWER TO

slow-speed drive problems?

GET THIS NEW BOOK

- **CHECK THE SIX REASONS WHY** *gearmotors are the most efficient means of speed reduction.*
- **SEE HOW INTERCHANGEABLE MOTORS** *on the new Westinghouse Gearmotor can help solve your postwar conversion problems.*
- **FIND OUT HOW EASY** *it is to select and specify the correct new Westinghouse Gearmotor for any job.*

Eight out of ten motor-driven machines require some type of speed reduction. But what's the *best* way to do it?

Years of experience in industrial power transmission have established the gearmotor as the most efficient, trouble-free method of speed reduction within the standard range of 1 to 75 hp. In addition, gearmotors save time . . . all the way from ordering to installation and upkeep.

This new 20-page book on Gearmotor Applications wraps up facts and figures on gearmotors—helps you find a better answer to your slow-speed drive problems. It shows successful gearmotor installations in varied industries, gives comparisons with other types of speed reduction. It describes the new, complete line of Westinghouse Gearmotors, tells how they can speed your war production and help postwar conversion. Call your Westinghouse representative today, for your free copy of B-3218. Or write direct: Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., Dept. 7-N.

J-07212

SEND FOR IT TODAY

Westinghouse Electric & Mfg. Co.
Gentlemen:

I'd like the facts on Gearmotors—what they do, and where to apply them. Send Bulletin B-3218.

Name_____

Address_____

Company_____

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

GEARMOTORS

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button

The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

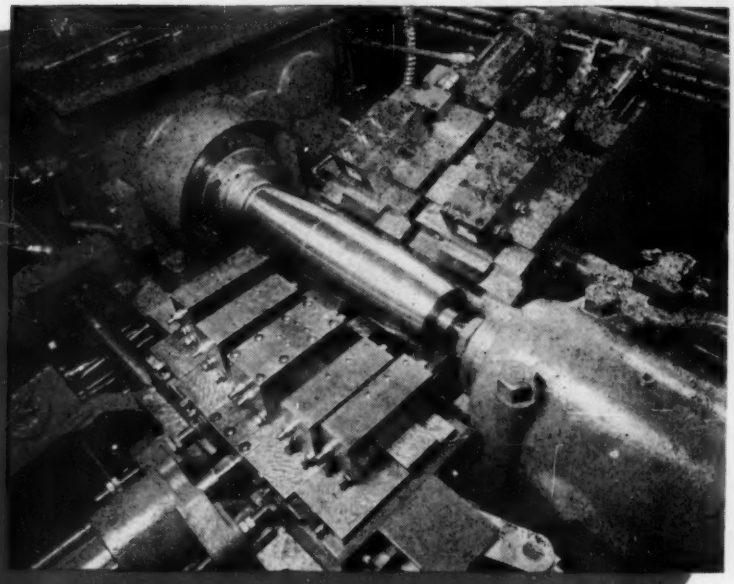
Many machines show 75 per cent greater average daily productivity.

DE VLIEG MACHINE COMPANY
450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

More pieces per man per hour



SPARKS
SEMI-AUTOMATIC HYDRA-FEED LATHE

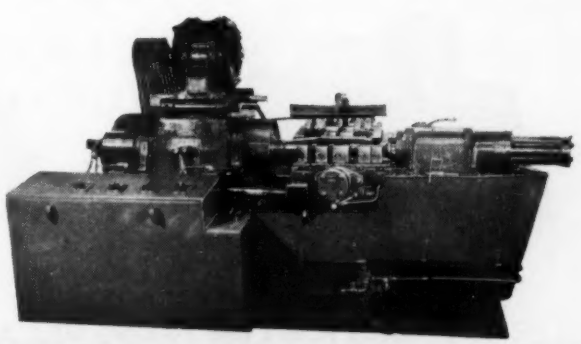
is proving an answer to the problem of manpower shortage

In its performance—proved ability to turn out more pieces in less time, in many cases with one operator handling more than one machine, the SPARKS LATHE definitely solves problems in mass production and overcomes the handicap of manpower shortage.

A typical case in point is that of finish turning the 155 m/m shell shown here. The remarkable speed of the SPARKS on this job is evidenced by a cutting time of only 48 seconds, achieved through the application of multiple tooling combined with automatic hydraulic control of all cutting operations and rapid traverse of tools during non-cutting time. Ability to apply these basic features to practically any turning job makes the SPARKS a particularly versatile machine for handling a wide range of work.

This example is but one of many where mass production records are being made by taking advantage of SPARKS versatility in tooling and control to meet the special requirements of the job.

If you are not getting the most from your available manpower — if you need a step-up in production, call in SPARKS engineers or send blue prints of the job for an estimate showing the time we can save you on a specific job.



SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

Horton chucks

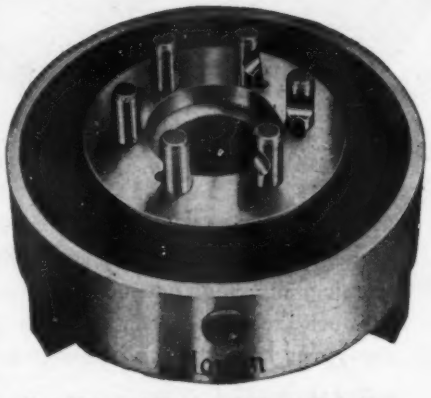
INDEPENDENT Solid Reversible Jaws Only

SCROLL UNIVERSAL Two-Piece Jaws Only

For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows Chuck for Type D (Cam Lock) Spindle

FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON
MORROW

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.

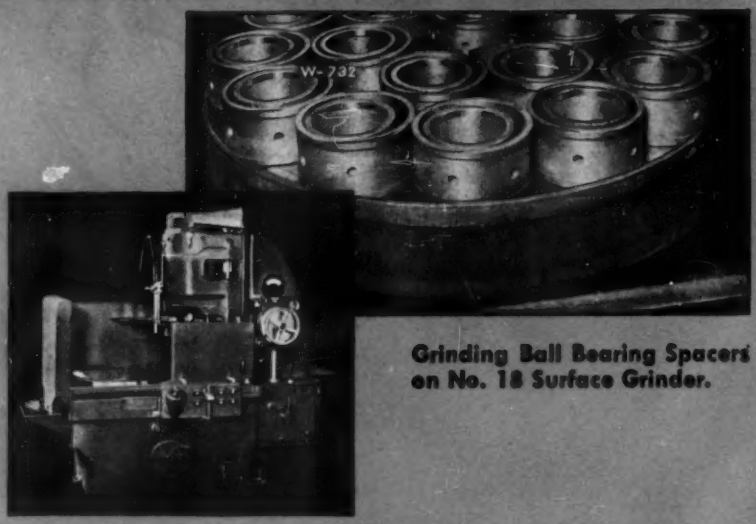
"PUT IT ON THE BLANCHARD"

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . ***Especially valuable on jobs like the one illustrated.***



Grinding Ball Bearing Spacers on No. 18 Surface Grinder.

EIGHTEEN large cast iron ball bearing spacers, with 18 smaller spacers inside of them, are placed on the magnetic chuck of this Blanchard No. 18 Surface Grinder. The pieces are held against the outer chuck ring and against each other. Two square blocks laid in the center of the chuck fill the gaps in the inner row.

.025" of stock is removed from each side of these cast iron spacers to limits of .0002". 36 large and 36 small pieces (144 surfaces) are ground per hour.

This job was previously done on a small surface grinder, taking about 20 minutes per pair. The operator offered this testimonial: "You can say from me that the feed on this machine is the most accurate I have seen."

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

meet Aircrafts' demand for

ACCURACY

Precision thread chasing is regularly done on a standard model Sidney Lathe without fuss or bother—at Consolidated Vultee as illustrated.

48 thread and feed changes are regularly provided through the standard gear box and anti-friction end gear train. Special threads are easily obtained by the use of additional change gears to meet individual requirements.

The actual thread chasing accuracy obtainable is determined by the accuracy of the lead screw itself. To assure the utmost accuracy on all thread chasing operations the Sidney lead screw—on all sizes and models—is not only made to the closest possible precision limits but checked by the best obtainable optical checking devices.

This is only one typical example of how Sidney Lathes are meeting close tolerances throughout the aircraft and allied industries. Bulletins on all sizes of Sidney Lathes available.

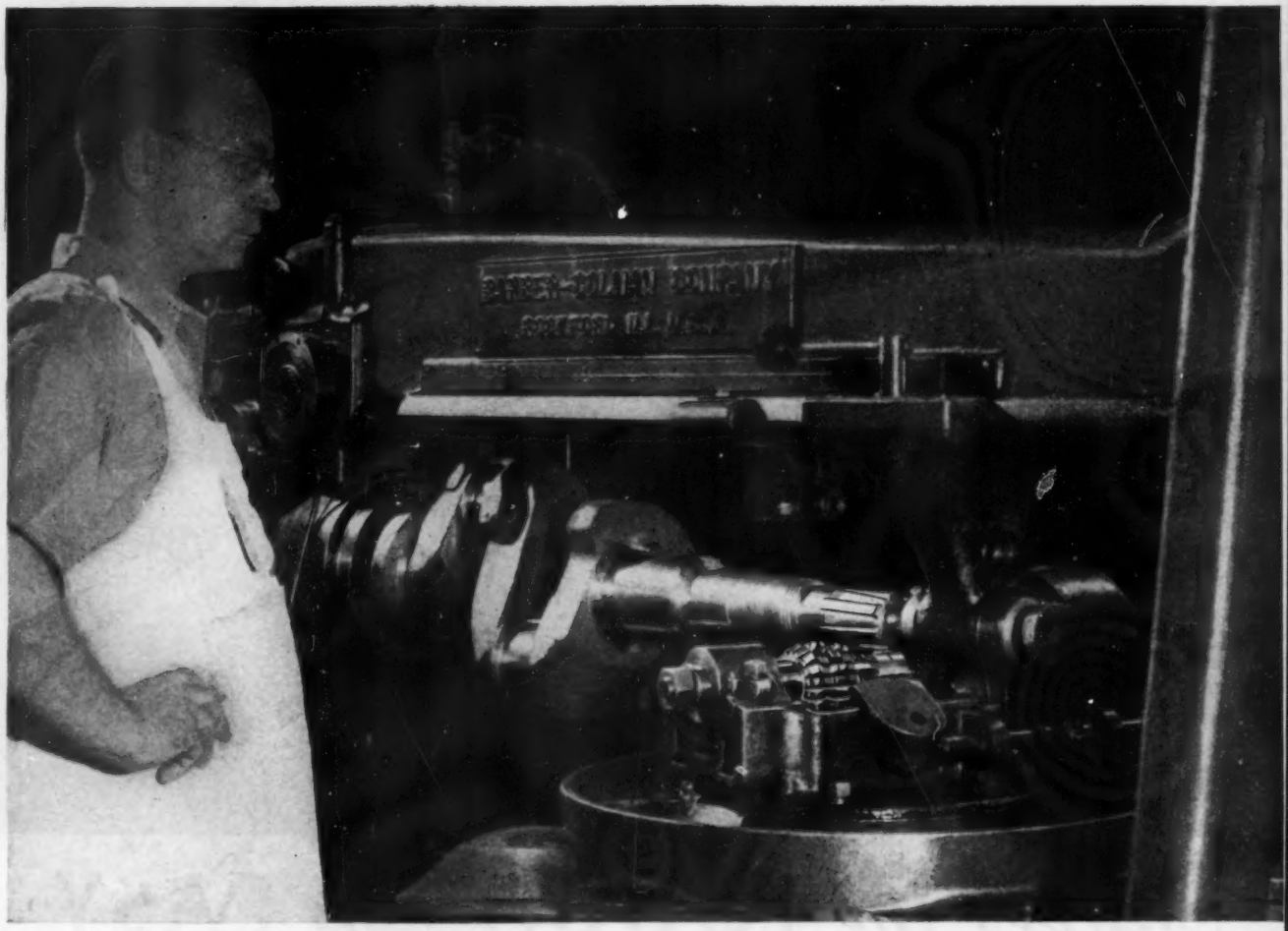
Photo courtesy Consolidated Vultee Aircraft Corporation

SIDNEY

The **SIDNEY MACHINE TOOL** *Company*

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO



EXTREMELY ACCURATE TAPER SPLINE HOBBED ON B-C TYPE "T" MACHINE

ACCURACY requirements on this large, heavy tractor engine crankshaft are extremely close, especially for the taper spline shown being hobbed on a Barber-Colman Type "T" Hobbing Machine. The splines must be equally spaced and parallel with the axis of the shaft within .0005". Furthermore, the splines must be located so that one of them comes within 2° of a reference based on the crank pin angle and a milled key slot in the opposite end of the shaft. The piece is 43-¾" overall length of which about 11" of the flywheel end is held in the collet nose work spindle. To cut the taper spline, the type "T" machine uses a special hob with graduated teeth which is travelled on an oblique path so that it receives a combination of both lateral and longitudinal feed. On this particular job, the oblique feed on a swivel setting of 54° 26′ 16″ was .024" per revolution of the work, with a hob speed of 60 r.p.m. The splined portion is 2-¾" long and 2-⅜" diameter, with six keys. The piece is a heat-treated steel forging of 260-302 Brinell hardness. This example is chosen to illustrate the large capacity of the Barber-Colman Type "T" Hobbing Machine as well as the accuracy of its work. The Type "T" can be used for all ordinary hobbing operations as well as taper splines. For further data, write for Bulletin F-1403-2.

CUTTING TOOLS ARE SCARCE
MACHINES CAN'T RUN WITHOUT THEM
CONSERVE WHAT YOU HAVE

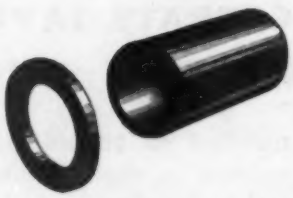
Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Makes the TOUGH *jobs* EASY

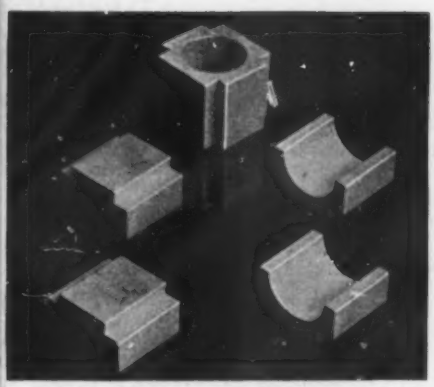


Here's a typical example of Johnson Bronze Engineering Service at work. The application in question had been served by a steel washer and a plain bearing. The difficulties present in this case were . . . in assembling—with two separate pieces . . . the constant maintenance and lubrication required . . . the tendency for the bearing to work out of place.

A Johnson Engineer reviewed the application and designed a new bearing . . . square on the outside . . . circular on the inside . . . with a flange replacing the washer. Then we produced them in LEDALOYL . . . our self-lubrication bearing material. Thus we solved all their problems at once . . . at a lower cost than the original assembly.

Excellent delivery can be had on LEDALOYL at the present . . . either from more than 2000 stock sizes . . . or made to your blue print specifications.

This is the kind of helpful service we render manufacturers every day. Perhaps we can help you with your bearing problems—NOW? There's a Johnson Sales Engineer as near as your phone.



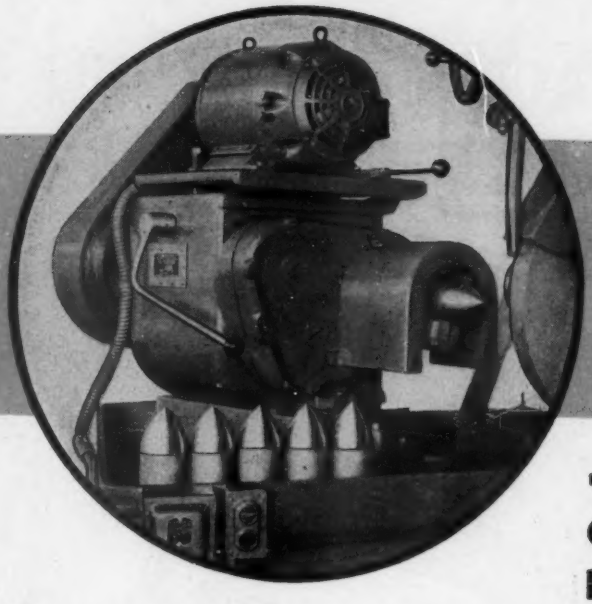
Ledaloyl **is ideal for odd or intricate shapes, as it eliminates all machining, provides self-lubrication. Write for new literature.**

JOHNSON BRONZE

SLEEVE BEARING HEADQUARTERS

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

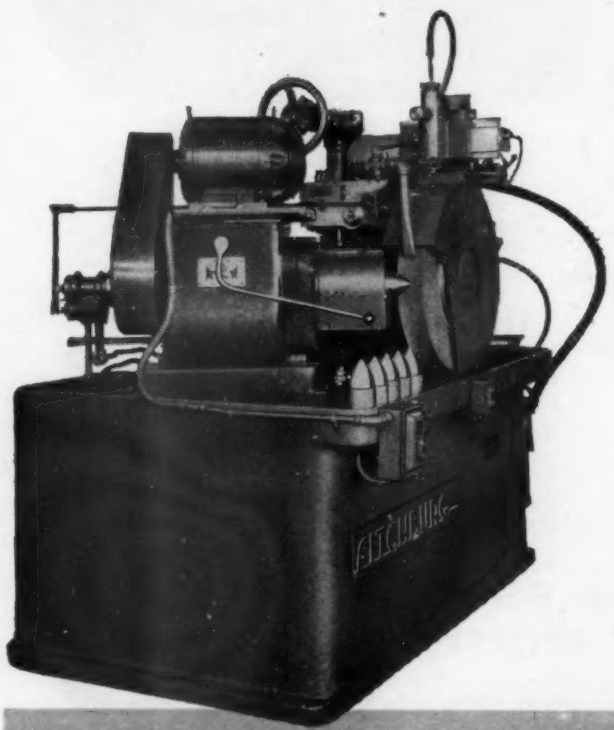
515 S. MILL STREET NEW CASTLE, PA.



on Grinding jobs like this

. . . FITCHBURG OFFERS SPECIAL ADVANTAGES IN MASS PRODUCTION

This Fitchburg special Chucking Grinder with a heavy duty headstock, is designed for grinding the ojive of armour piercing shells. The wheelhead is a Fitchburg Standard Bowgage Unit carrying a 24" x 3½" face wheel. A hydraulic form trueing device is mounted on the wheelhead.



To operate this machine the operator places the shell in the open jaw chuck, then, by pushing a ball lever forward, closes the chuck, clamping the work piece at a definite distance from the bottom of the shell. To start the work rotation, operator depresses the long lever and pushes the button to start the automatic grinding cycle.

When installing special precision grinding equipment, it is well to remember that the Fitchburg Bowgage Grinding Wheelhead is a standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

. . . Write today for folder giving complete details.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

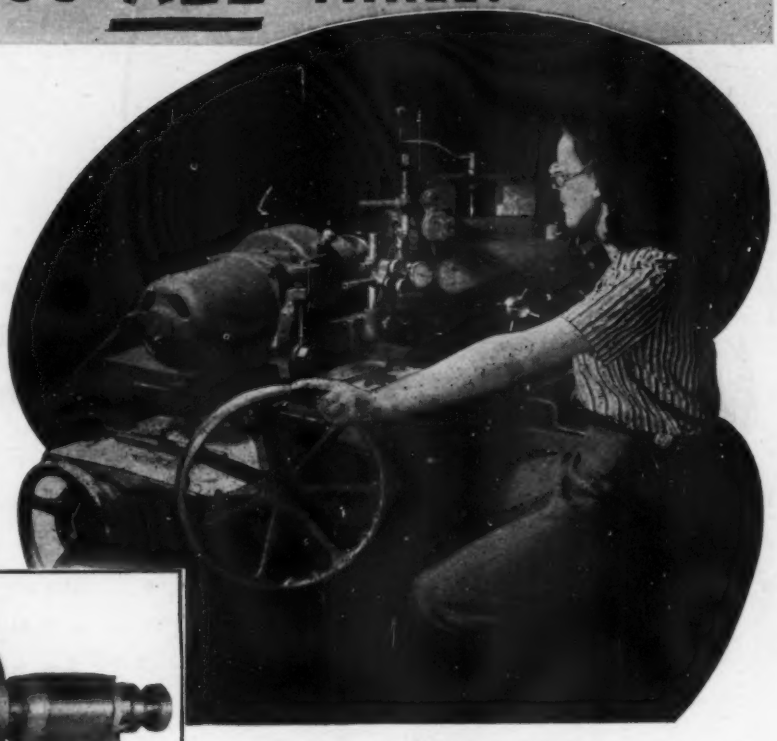
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

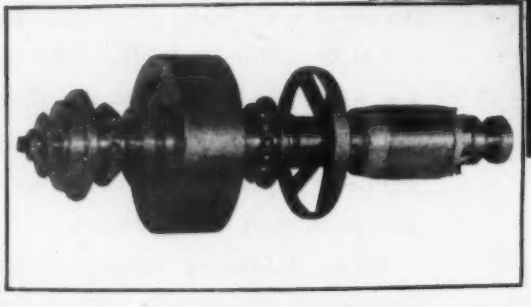
THE MILWAUKEE FACE MILL GRINDER GIVES YOU ALL THREE!

1 UNUSUAL RIGIDITY

2 REDUCED SHARPENING TIME

3 ACCURACY TO WITHIN .0002 PER INCH





The three-bearing spindle rotates at 3,400 R.P.M. and carries a heavy flywheel, the inertia of which when in motion successfully keeps the abrasive wheel up to grinding speed. Sharpening time has been considerably reduced as a result.

THE basic design of the Milwaukee Face Mill Grinder embodies strength, precision, and capacity. It is capable of sharpening Tungsten Carbide Cutters ranging from 3" to 16" in diameter — grinds the blades to within .0002 per inch.

Set-ups are quickly made with graduated dials, facilitating adjustments. Other controls are handily located for simplified operation.

OTHER IMPORTANT FEATURES:

1. Jeweled bearing dial indicator for accurate checking.
2. Finger tip control.
3. Fine thread precision saddle screw.
4. Hand screw permits angular setting of 15° on either side.
5. No adapters necessary.
6. Spindle has No. 50 National Standard Taper.
7. Blower system at slight extra cost.

Reject the Source of the Error . . . not the Finished Product . . . USE CENTER SCOPE!

The Center Scope is an optical locating machine shop tool, constructed for use on any machine from jig borers to bench drills. No technical knowledge or training is needed to use it. It is a necessary production tool — necessary today because you are interested in saving time — tomorrow, because you will be interested in saving cost.

Built in various models; variable and rotating Center Scope priced at $97.00, with taper shank, $125.00; Special Center Scope, $125.00 — Edge Block, $23.00 additional.

Write Department CS, for complete information.

KEARNEY & TRECKER PRODUCTS CORPORATION • *Milwaukee, Wisconsin*

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

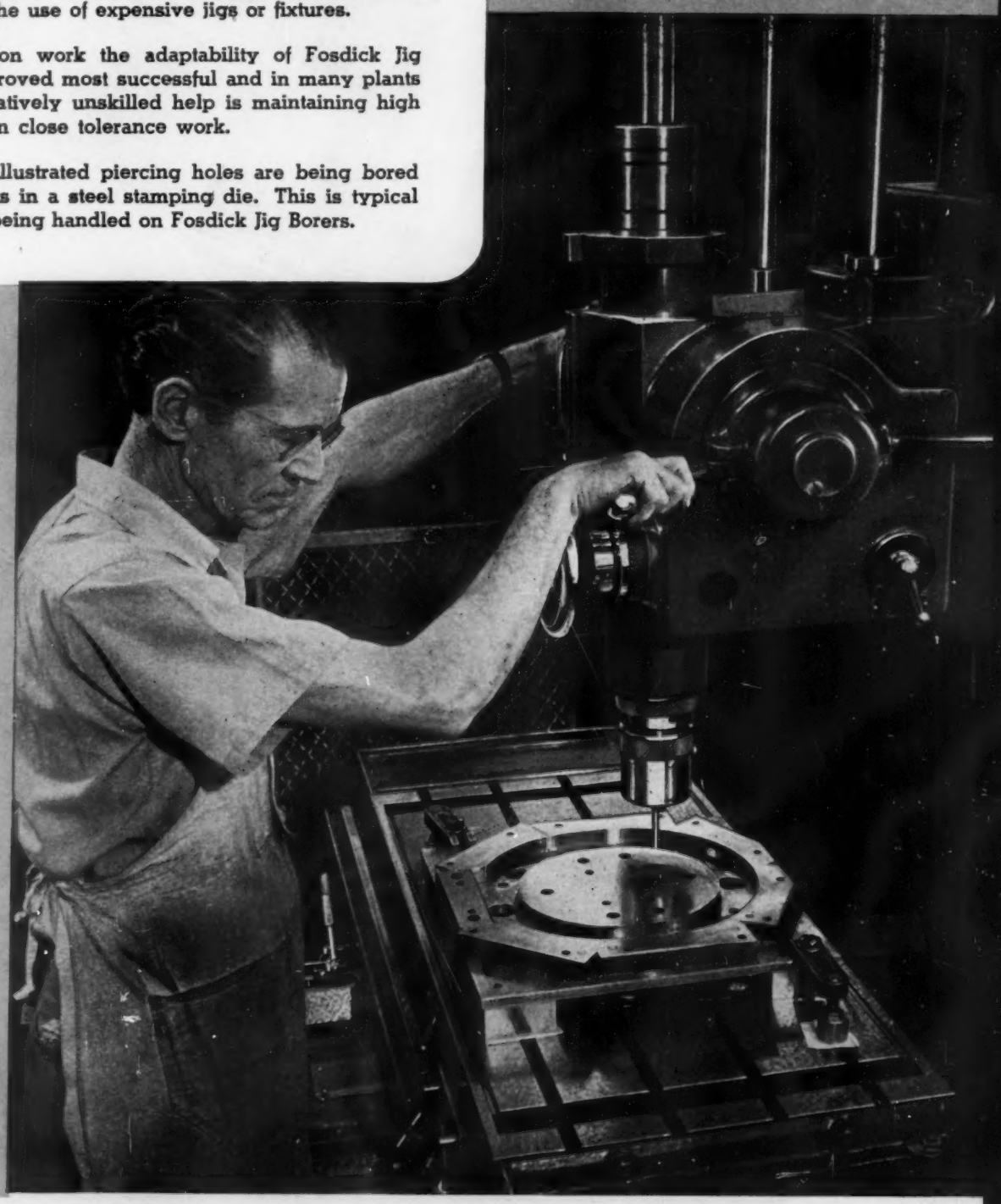
FOSDICK

JIG BORER

• Due to its extreme versatility the Fosdick Jig Borer has proved a wise investment for tool room operation where close tolerances are required and where it is necessary to change frequently from one job to another. It is a medium priced machine tool and is being used successfully on a wide variety of operations and does not require the use of expensive jigs or fixtures.

On production work the adaptability of Fosdick Jig Borers has proved most successful and in many plants with comparatively unskilled help is maintaining high production on close tolerance work.

On the job illustrated piercing holes are being bored to close limits in a steel stamping die. This is typical of the work being handled on Fosdick Jig Borers.



ARMY E NAVY

WRITE

for Jig Borer Bulletin J.B.A. for complete details

FOSDICK MACHINE TOOL COMPANY
CINCINNATI ... OHIO

How many machine tool operations help to arm these
gods of the upper air. . .
Into a single engine of the planes they fly, go thousands of individual manufacturing operations . . . to accuracies measured in thousandths, ten thousandths or even millionths of an inch.
The power of a single turret gun is the sum of a dozen engineering sciences and a hundred skills.
Even the breath of life itself, to these gods of the upper air, is the product of many machines.
And of all the complex, intricate and wonderful tools in use by the aviation industry, none is more basic or more vital to production than the precision internal grinding machine.
BRYANT
BRYANT CHUCKING GRINDER COMPANY
SPRINGFIELD, VERMONT, U. S. A.

The POSTWAR *Automatic* Screw Machine is Here

GIBBS Model 375 AUTOMATIC

Turning . . . Forming . . . Drilling . . . Reaming . . . Threading . . . Knurling . . . Counterboring . . . Undercutting . . . Tapping . . . Slotting . . . Spotting

NOW!

What every manufacturer is looking for in the machine tools he buys today is . . .

1. ***Top-speed*** **war production now, plus assurance of**
2. ***Low-cost*** **production in the postwar period to come.**

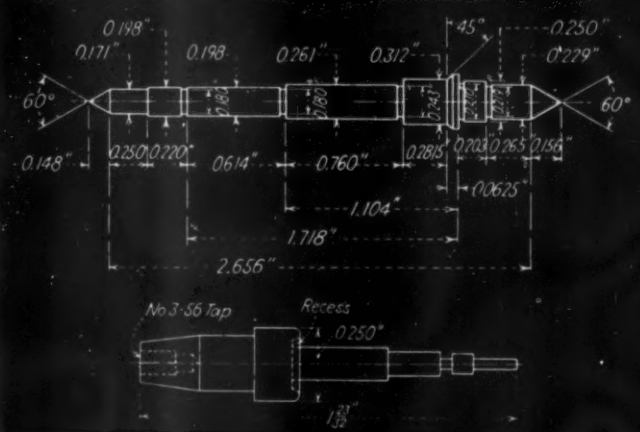
That's why the Gibbs Model 375 Automatic Screw Machine is being made available to American industry at this time . . .

For the Gibbs Automatic is a completely up-to-the-minute machine tool capable of mass-producing small precision parts . . . at high speed . . . to tolerances as close as .0002" . . . and using men and women operators with only average skill.

5 cutting tools and 5 special Gibbs attachments give the machine the widest possible range of machining operations. In fact, in scores of war industries, the Gibbs Automatic has already proved its war worth in turning out hundreds of different intricately shaped small parts from bar stock.

Of course your top interest today is war production. But you probably also have an eye on the future when low-cost operation will once more become all-important. In either case, and for *both* reasons, you'll want to know more about the Gibbs Automatic.

Fully automatic—it will do all of these operations in one production cycle...



Submit any "Small-Piece" problem to Dept. 5. No obligation to you, of course.

SEND FOR THIS BOOKLET

Booklet A-102 is yours for the asking. It illustrates the many exclusive features of the Gibbs 375 Automatic and shows how it can make small precision parts for you at high speed and low cost.

THOMAS B. GIBBS & COMPANY

DIVISION OF THE GEORGE W. BORG CORPORATION

DELAVAN. WISCONSIN

New Ampac Wins 2 to 1!

You see big differences when you compare a-c welders today. In modern features assuring you easier operation, lower upkeep, faster and better welding . . . you'll find that Allis-Chalmers' revolutionary new Ampac "200" leads by 2 to 1!

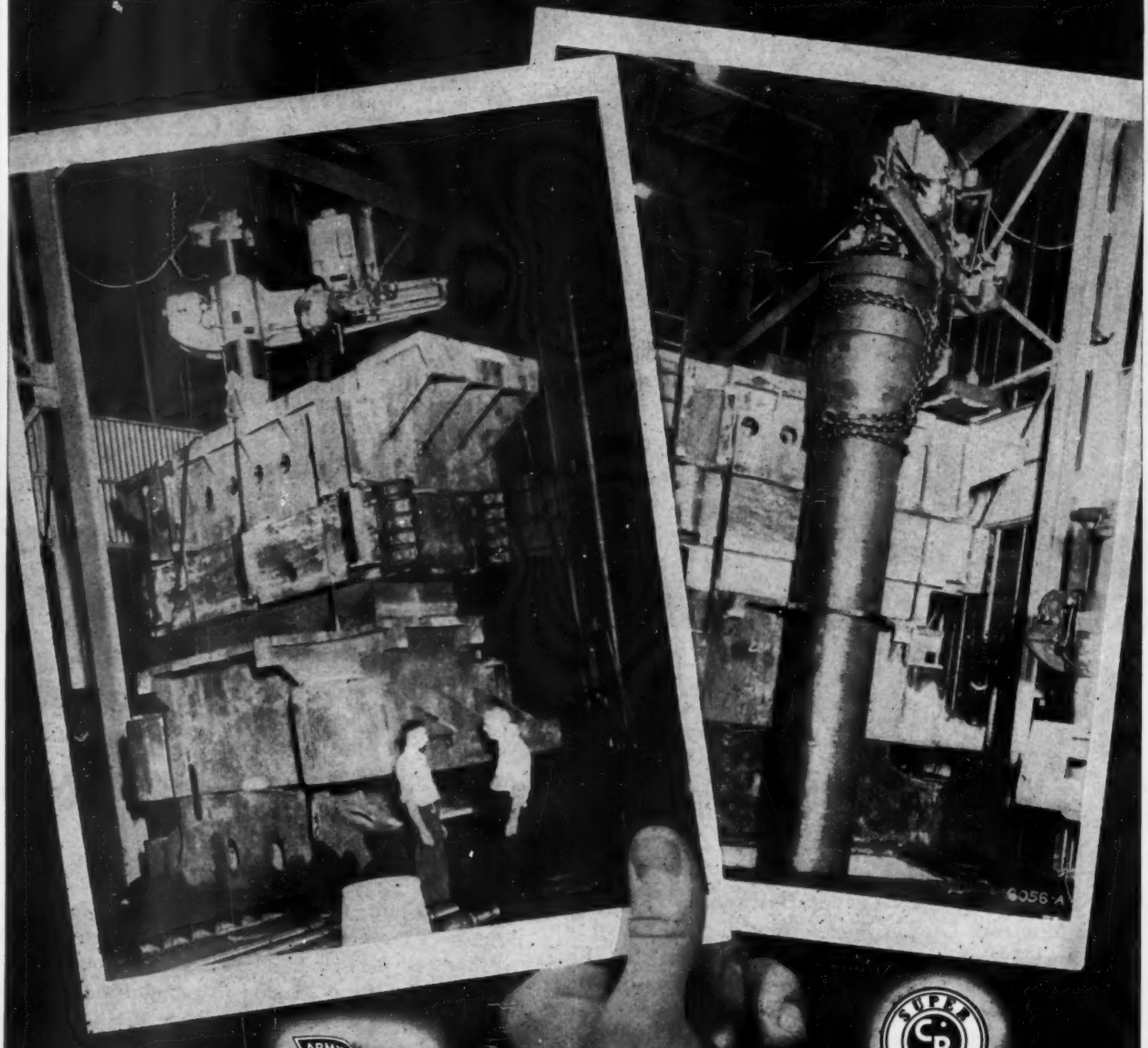
Compare 4 leading types of Transformer Welder in their Use of 11 Important Features . . .

IMPORTANT FEATURES	HOW THEY BENEFIT YOU	AMPAC "200" (Integrated moving core type)	WELDER "B" (Moving coil type)	WELDER "C" (Moving core type)	WELDER "D" (Shunt type, moving core)
1 No arc blow to slow down welding.	Steady arc makes sound, uniform welds. You can weld in corners and grooves easily. Production is speeded.	YES	YES	YES	YES
2 Low striking voltage at high amperage.	Saves power for you. No need for high voltage at high currents. Raises power factor — cuts power input.	YES (65 volts)	NO (75 volts)	NO (75 volts)	NO (75 volts)
3 High striking voltage at low amperage.	Strikes arc fast. Gives you high, yet safe voltage necessary. Makes a-c welding easy at low currents.	YES (78 volts)	NO (72 volts)	NO (75 volts)	NO (75 volts)
4 Takes less than 300 sq. in. floor space.	Small size saves valuable space on crowded shop floors . . . makes it easier for you to move and handle the unit.	YES (28[illegible] sq. in.)	NO (361 sq. in.)	NO (398 sq. in.)	YES (288 sq. in.)
5 Contains less than 5 wearing parts.	Cuts maintenance to simple lubrication twice a year. Less chance for wear means longer service, lower upkeep.	YES (3 parts)	NO (8 or more)	NO (6 or more)	NO (8 or more)
6 Low original cost (no rotating element).	Simpler construction of a-c welder cuts purchase price to around 65% of what you would pay for a d-c welder!	YES	YES	YES	YES
7 Wide welding range of over 200 amperes.	You can weld thin sheets . . . yet have capacity for heavy plates, too. You can use rods from 1/16" to 1/4" in size!	YES (220 amp)	YES (215 amp)	NO (195 amp)	NO (195 amp)
8 Reconnectable for 220-440 & 208 v., 60 cycle.	Gives you full capacity at low voltages where lines are long and isolated. Can be used on *any* standard a-c voltage!	YES	NO (220 or 440)	NO (220-440 only)	NO (220-440 only)
9 Over 85% efficiency at normal loads.	You enjoy *full* benefits of a-c welding: lower power loss, high power factor, lower operating costs!	YES	NO	YES	YES
10 All settings within six control turns.	Saves welding time. Welder can make simple adjustment from high to low amperage current quickly and easily.	YES (6 turns)	NO (50 turns)	NO (30 turns)	NO (15 turns)
11 Movement of variable part 2" or less.	Cuts wear and maintenance to a minimum. Reduces hum and vibration Contributes to trouble-free operation.	YES (1 inch)	NO (9 inches)	NO (6 inches)	YES (2 inches)
	Only Ampac gives you all 11 . . . TOTALS	**11** Ampac "200"	**3** Welder "B"	**3** Welder "C"	**5** Welder "D"

ALLIS-CHALMERS AMPAC "200"

WRITE ALLIS-CHALMERS, MILWAUKEE, WIS., FOR COMPLETE INFORMATION

to save TIME...



ARMY E NAVY
AWARDED SEPT. 10, 1942

SUPER C B SERVICE

The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, use one of their six Cincinnati Bickford Super Service Radial Drills to handle this unusual job. This is a standard machine with 6' arm, 15" dia. column, table extension base and cutting lubricant system.

This job consists of drilling and tapping sixteen 3½" holes in one end of a 25' long, 45" dia. Bottle Booster Cylinder for a 1000-ton H-P-M FASTRAVERSE Hydraulic Forging Press, and drilling and tapping eighteen 3¾" holes in the other end.

This is one of the special jobs that frequently comes into a factory at the most inopportune moment and takes rather ingenious maneuvering to facilitate the necessary operations without a break in the schedule.

Write us for further information on this or other Cincinnati Bickford Super Service Metal Drilling Machines.

THE CINCINNATI BICKFORD TOOL CO.

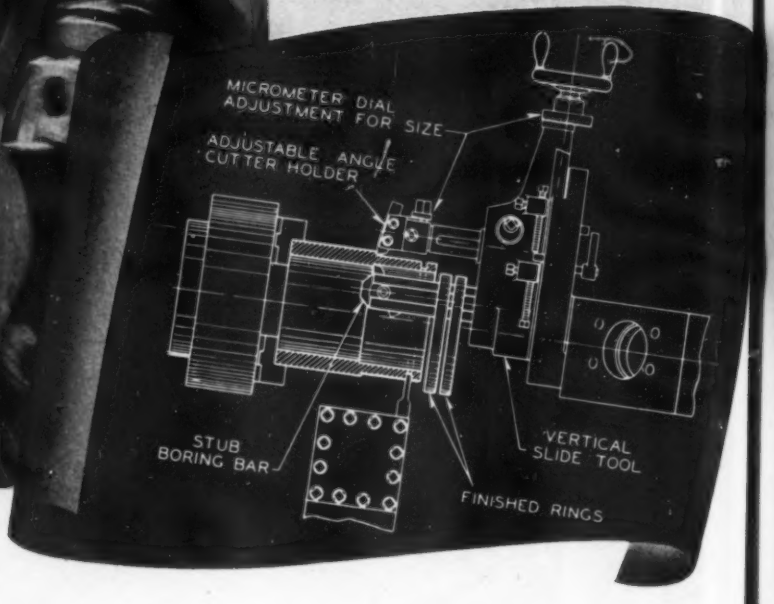
OAKLEY · CINCINNATI · OHIO · U. S. A.

...from the Production Li... behind the Firing Lines

IDEAS FOR VICTORY — AWARDED BY WARNER & SWASEY

R. J. CHARLEBOIS

A Citation for Me... in War Industry



MACHINING RINGS IN ONE CHUCKING

R. J. Charlebois machines rings on a Warner & Swasey Turret Lathe at Canadian Vickers, Ltd., Montreal, Canada. The former method called for two chucking operations. In the first chucking, tubing was turned, bored to size, and cut off. In a second chucking, the rings were held in soft jaws and faced to correct lengths.

The accompanying sketch shows how operator Charlebois developed a setup to complete the job in one operation. Tubing is held in longer lengths in the chuck. A slide tool mounted in the hex turret is set up with stub boring bar to bore the hole, while an adjustable angle cutter holder turns the outside diameter. Quick adjustment to size for boring operation is made by dial on the slide tool. Dial screw on the adjustable angle cutter holder provides quick setting for turning diameter size.

A parting tool, held in the right side of the square turret cuts off rings to proper length as the turning and boring operation advances, and the finished rings drop down onto the boring bar.

To operator Charlebois goes a gold "Ideas for Victory" Pin. Warner & Swasey has been glad to send these pins to hundreds of operators in the United States and Canada in recognition of their ingenuity and initiative in making the best use of tools and equipment at hand. Many of the ideas they have put to work in the shop, are passed along in "Blue Chips", a shop paper sent free to the homes of over 70,000 operators.

Are your operators getting "Blue Chips" regularly? We'll be glad to put their names on our list. Write Warner & Swasey, Cleveland, Ohio.

WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTER, FOR LESS ... WITH A WARNER & SWASEY

What's In This Issue

H. A. FROMMELT

Milling Machine Set-Ups

Any one job on a milling machine may be set up in a variety of ways. Usually, however, there is one set-up that is more rigid or otherwise better than the others, resulting in greater accuracy, increased production or both. Specific examples of efficient and proved set-ups are illustrated and described by H. A. Frommelt, Kearney & Trecker Corporation, in an article on page 90. This is the first of a series on toolroom milling practice.

Putting the Small Shop to Work

Gathering other producers into a manufacturing mosaic that spells a 34 million dollar wartime business, American Type Founders worked out a system that makes subcontracting an efficient, smoothly functioning business. At the same time, the company has preserved its organization intact, while saving the business lives of a large number of small shops, and also the government many millions of dollars that would otherwise have been spent for new machines. John Haydock, managing editor of American Machinist, has written an article telling of American Type Founders' system of subcontracting. It begins on page 83.

Roller-Turner Tool Design

Bar stock turning operations are such an important factor in war production that the design of roller turner tools for two types of turret lathes has been reduced to accepted practice. The rules to be observed in applying carbide roller-turner tools and the details in connection with the design of them for one type of turret lathe are discussed by R. D. Mack, of Carboloy Company, Inc. His article begins on page 87.

Women Have Made the Grade

Decreased manpower and increased demand for production go hand in hand with modern warfare. In this era of mechanized armies, manufacturers of war products have turned more than ever before to the hiring and training of women to fill places on the assembly lines. The production records hung up by former housewives and sales girls, manicurists and models, have been highly gratifying to those responsible for their selection and placement. It would appear that, with the proper training, selection and placement, woman's place in industry may be limited only by her strength and endurance. Page 94.

Assembling the Dauntless

A mating operation performed without stopping the production line, and assembly carriages with readily variable heights, are two of the work-speeding operations used by Douglas Aircraft Company in turning out the land-based *Dauntless* (A-24) dive bomber. An article originating on page 97 tells the story of the *Dauntless,* and how its horizontally split fuselage is assembled and the landing gear affixed, while bolted into a roller carriage of heavy structural steel. The various steps of assembly performed at the 62 work stations along the two parts of the production line are described.

Exceeding Fine

Speed and accuracy in working to extremely close tolerances characterize the modern grinder, and have promoted it to a position of importance in the field of fine surface machining. The size and shape of work is not a limiting factor. Grinder operation is largely automatic, but a good worker will strive to know all he can about his machine. Thus, an installment of the "Tools of Our Trade" series is devoted to a thorough explanation of grinders and their use. To read this article, turn to page 105.

C. E. STOODLY

Bearing Inspection

There have been devised some special instruments for inspecting ball bearings for precision instrument work, by which it is possible to measure the radial play, the axial shake and also to test for sensitivity. An article by C. E. Stoodly, Schenectady Works, General Electric Company, page 92, describes the three inspection fixtures and their use.

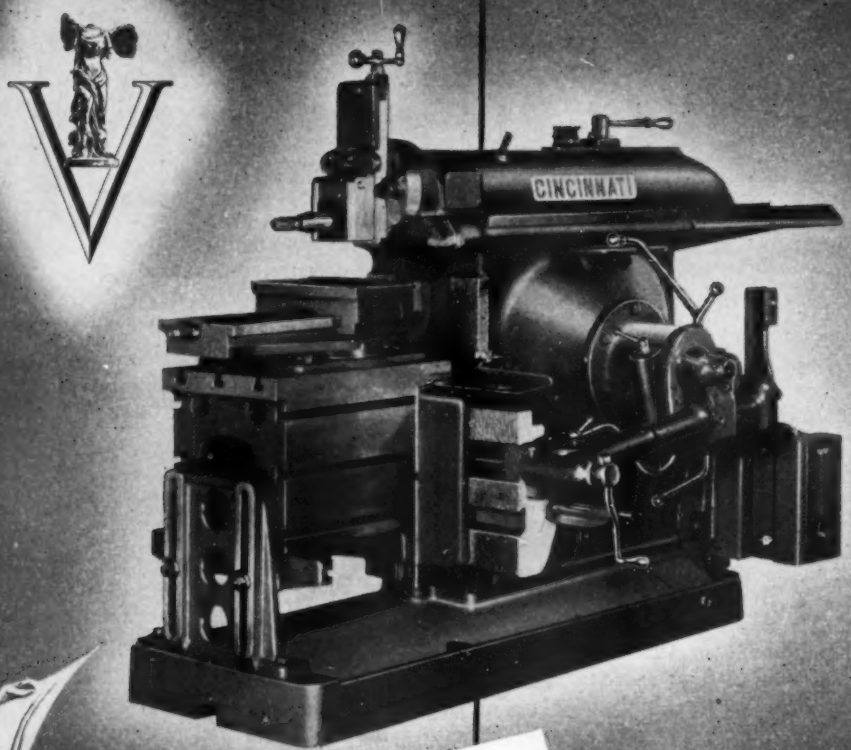
COMING

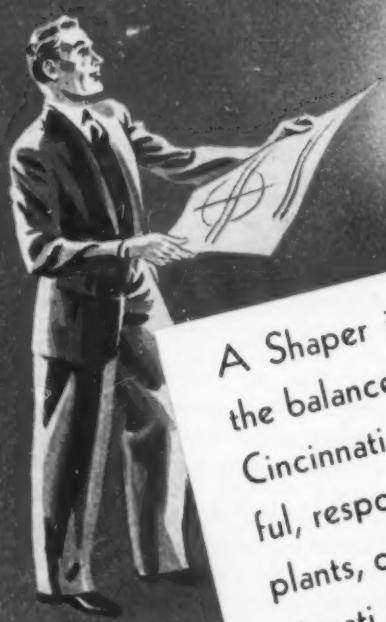
In a soon-to-be-published article, readers will be told of the use of toolholders which incorporate necessary cutting angles to make possible the use of standard toolbits for heavy machining operations, with resultant economies in procurement, cost and grinding. Developed for tank turrets, these toolholders are generally useful.

Scale models of machines, fixtures, components and full assemblies have enabled Douglas Aircraft Company more quickly to arrange efficient, space-saving plant layouts. Overhead space is more easily visualized, and various arrangements are more simply experimented with. The story of Douglas' plan of "Plant Layout in Three Dimensions" will be published soon.

By the same careful attention to reducing part costs as was practiced upon peacetime output of cars, Chevrolet has made significant savings in material, labor, machinery and cost in manufacture of military trucks and aircraft engines. A number of examples will be detailed in a future number.

Check Your CENTER of GRAVITY!





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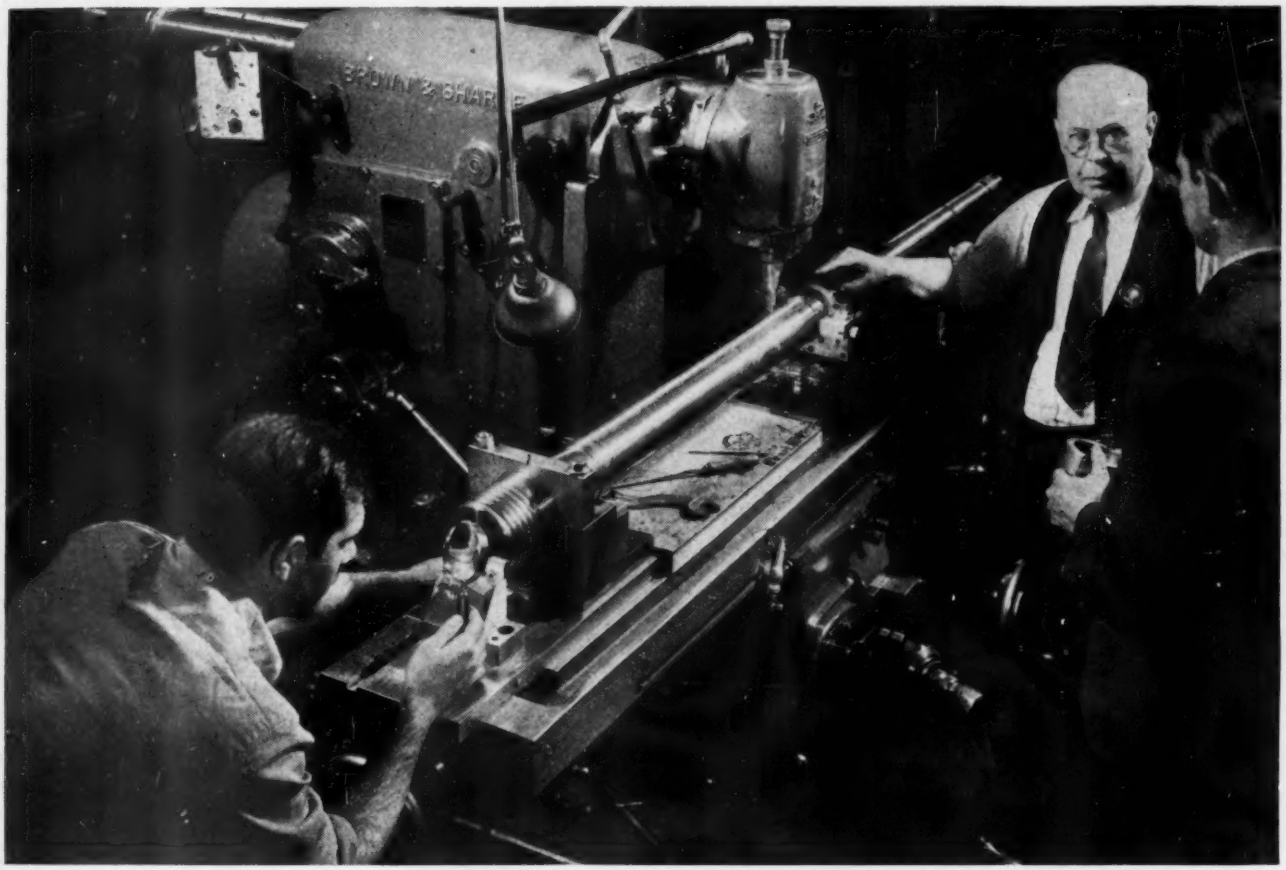
American Machinist

ESTABLISHED 1877 · BURNHAM FINNEY, EDITOR



An inspector checks the set-up of a gun barrel prior to milling the ejector slots

Subcontracting Made to Work

BY JOHN HAYDOCK, MANAGING EDITOR, AMERICAN MACHINIST

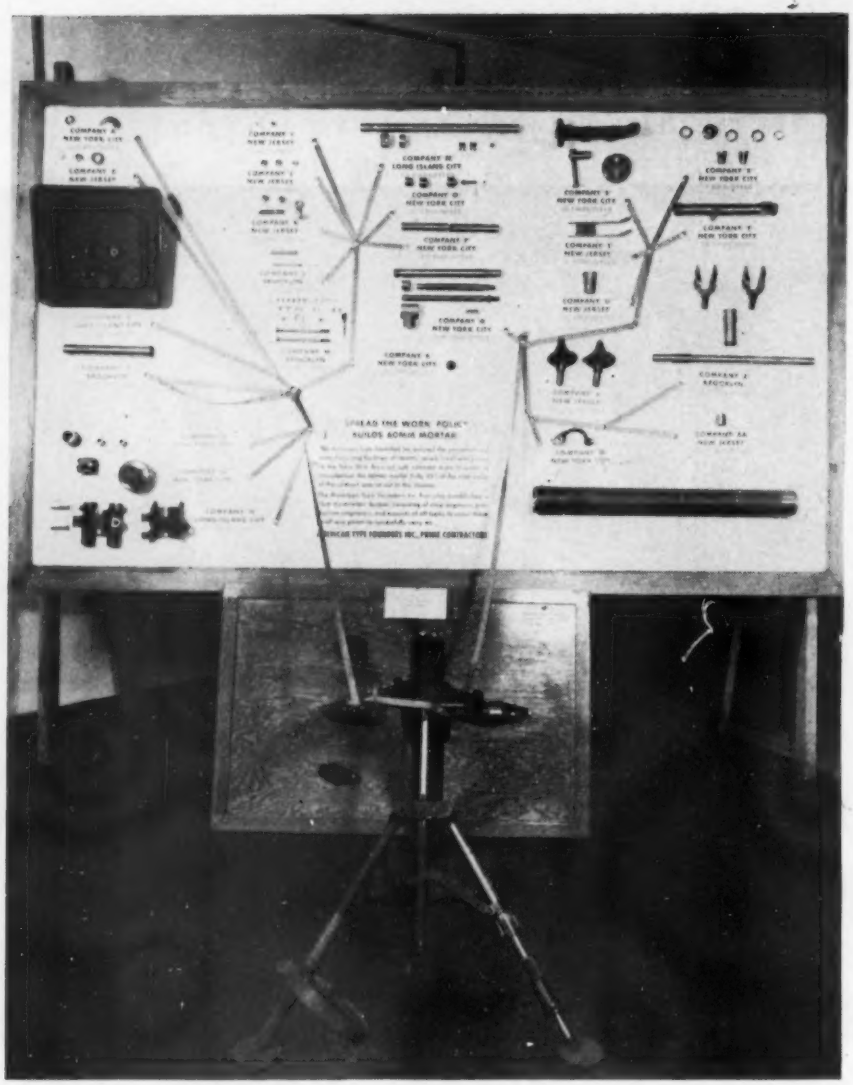
American Type Founders has created a separate division to supervise the manufacturing activities of outside plants on sublet orders. Control of these operations covers tools to finished product

THE SUCCESS OF SUBCONTRACTING is genuine evidence of the kind of industrial cooperation that will win the war. By breaking down war products into their "bits and pieces," hundreds of shops are turning out munitions that would otherwise be unable to do their part. Thus machine tools and other manufacturing equipment are put to work in an all-out effort to gain victory in the battle of production.

But there is a lot more to subcontracting than the placement of orders in outside plants. Any prime contractor who stops there is doomed to failure. He will find a great variation in managerial responsibility, shop equipment, mechanical skill and ordinary "know how" in the plant whose aid he seeks. If he leaves each of these plants to work out its own destiny, the essential teamwork will be missing.

American Type Founders, Inc., has a wartime program based on wide use of subcontracting. The company's normal products are presses and other printing equipment, including type. Today its facilities have been converted 100 percent to the needs of our armed forces.

The company got into the war early. When the European conflict started in 1939, the executive committee looked ahead and weighed the probabilities for the future including our own entry into the war. It seemed clear that



A display board shows the flow of 60-mm. mortar parts to the American Type Founders plant from 27 small manufacturers in the New York area

they could not continue to manufacture printing machinery. It was also evident that, if they waited until something came their way, they were likely to fold up before obtaining a sufficient volume of war business to keep their plant operating. Thus it was decided to bid on war contracts so the organization could learn what ordnance materiel was like.

Started With Tank Guns

The first order was received from the British. Prime Minister Churchill had sent a mission over here to buy tanks. One of their requirements was 37-mm. tank guns and mounts, complete, including barrels and breeches.

American Type Founders built a plant for making the barrels, manufactured some components in their own shops and subcontracted others. Thus the company obtained real experience in gun manufacture and in subcontracting procedure before the United States got into the war and before lend-lease was thought of. In fact, 3,500 guns were delivered before the lend-lease bill was passed.

First U. S. Orders

When the United States entered the war our government procurement agencies were cold to the subcontracting idea. Unlike the British they had no experience with the "bits and pieces" program and wanted to see shop equipment capable of handling complete contracts before they placed an order. Some orders were refused on this basis. However, as the pressure increased, the American Type Founders did receive war orders, expanded personnel and made an enviable record on delivery.

As the months passed the advantages of this arrangement became obvious. The company was then asked by the government to take over three companies and to set up two new assembly plants for which components were to be subcontracted 100 percent. Under a contract for the Navy, all the work, even assembling is done by subcontractors. Now the company is operating eight plants and has 293 subcontractors not including material suppliers, toolmakers and parts venders.

Subcontracting Problems

What is so difficult about subcontracting? The trouble, which many prime contractors have experienced, lies in the fact that a potential subcontractor, while having something to contribute to the war effort, is woefully weak in certain of its functions. It is necessary for the prime contractor to secure the necessary priorities for materials, to perform the endless round of paper work essential under wartime control. The prime contractor must also arrange for the procurement of needed equipment to round out the subcontractor's manufacturing facilities and for the conversion of existing machine tools to war work. He must instruct him in meeting government standards of quality and supply gages, fixtures and inspection equipment. He must send men from his own organization to supervise the starting of important jobs and to inspect the finished product. He must keep a complete record of every detail from the time of placing an order until its final delivery so as to retain in his own hands complete control at all times.

Many prime contractors facing the job of doing so many things for their subcontractors have thrown up their hands in despair or have relied solely on well organized concerns for their outside work. Unfortunately this policy excludes many of the smaller shops willing to make their contribution in the war effort but lacking the know how.

American Type Founders discovered early that supervision of contractors was a business in itself. It found that the first essential of successful operation was to divorce all executive manufacturing functions in subcontracting completely from its own production activities.

Division Set Up

To do this the company has set up the Munitions Product Division which deals solely with subcontracting activities. This organization is broken down into functional departments as follows:

Office management
Purchasing, traffic and expediting
Engineering
Facilities and quality control
Inspection

In addition, it has three product departments: artillery, aircraft and accessories. A division handling Navy products is similarly set up although it does not come under the supervision of the Munitions Product Division.

Let us trace the course of a war contract to see just how it is handled. It is first checked by the facilities department to see where the work can be placed. This department has a card index of over 2,000 concerns listing their complete shop facilities. Before the subcontracts are actually placed, the subject is brought before the placement committee, the members of which are familiar with production problems and also the capabilities of the shops in question.

All Drawings Checked

Meanwhile, the drawings are checked by the engineering department. This step includes a complete analysis of the components and assemblies in order to make sure that the proper tolerances are specified and that the parts will go together when made according to specifications. Government procurement agencies expect to get a product that will function under severe wartime conditions, but they do not guarantee that the drawings they furnish will insure this result. Consequently, the burden of responsibility falls upon the prime contractor.

Another step that must be taken upon receipt of the order is to design all tools and fixtures. These may be made by the prime contractor, the subcontractor or an outside tool shop, but in every case the tooling must be coordinated so that all parts of an assembly will mate together without difficulty. Some subcontractors prefer to design their own tools, and if they are capable of doing so, the practice is encouraged. The subcontractor's responsibility for a part does not cease until the part is fitted into an assembly. The usual practice is to have each subcontractor send in a sample part for a pilot assembly before proceeding with the entire order.

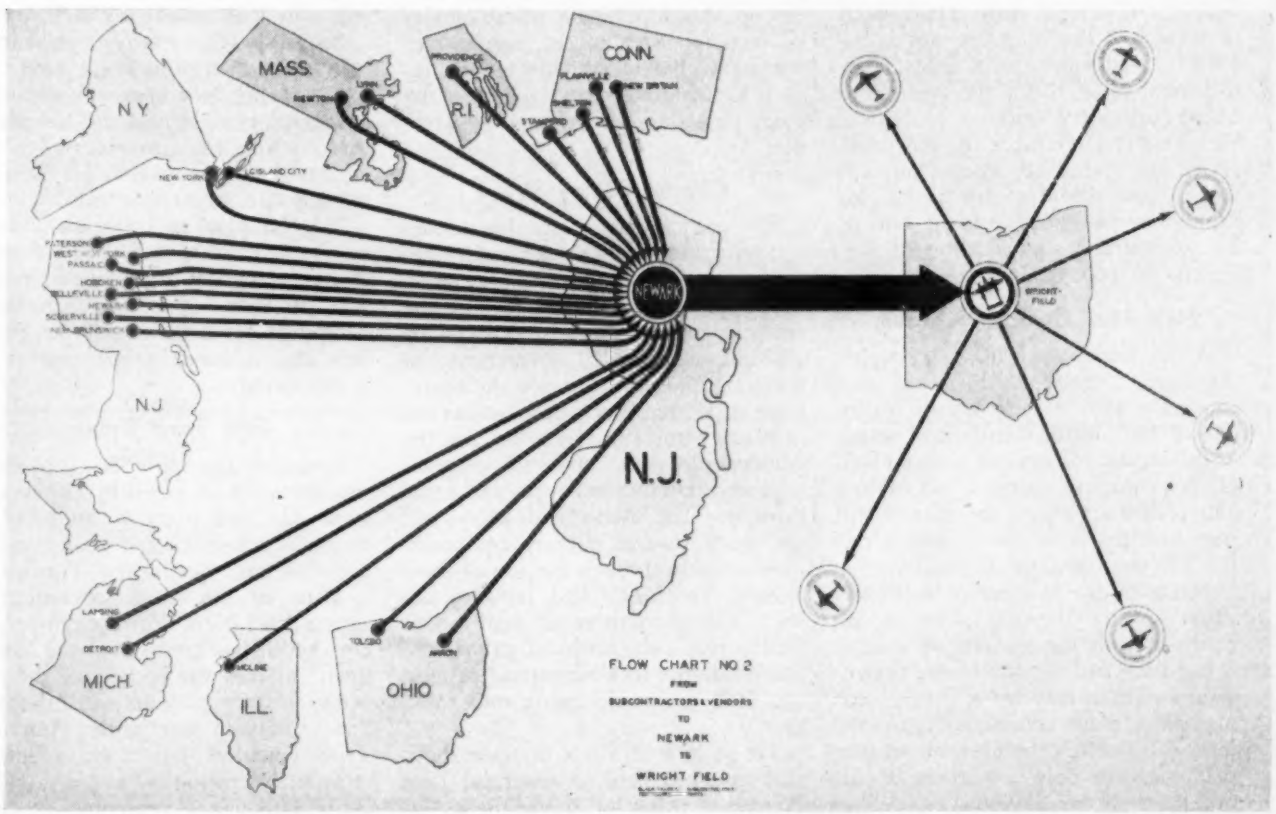
Final quality control is centered in a new constant temperature gage laboratory which American Type Founders has built in its parent plant. This room contains the finest of precision measuring equipment and is capable of accuracy to 100,000th of an inch. It is recognized by the U. S. Army Ordnance Department as having facilities equivalent to its own. Gages are checked here under dust-free conditions to make certain that all parts wherever they are made will conform to one strict standard of accuracy.

By far the most important phase of subcontracting centers in the corps of field men who are in daily touch with subcontractors' plans. These groups are centered under area supervisors. Each supervisor has specialists in foundry work, forging, machine tools, final inspection and other phases of manufacture so they can advise subcontractors in the correct procedure to follow to complete the job. In Detroit the company set up a training school to make inspectors of unskilled men and women.

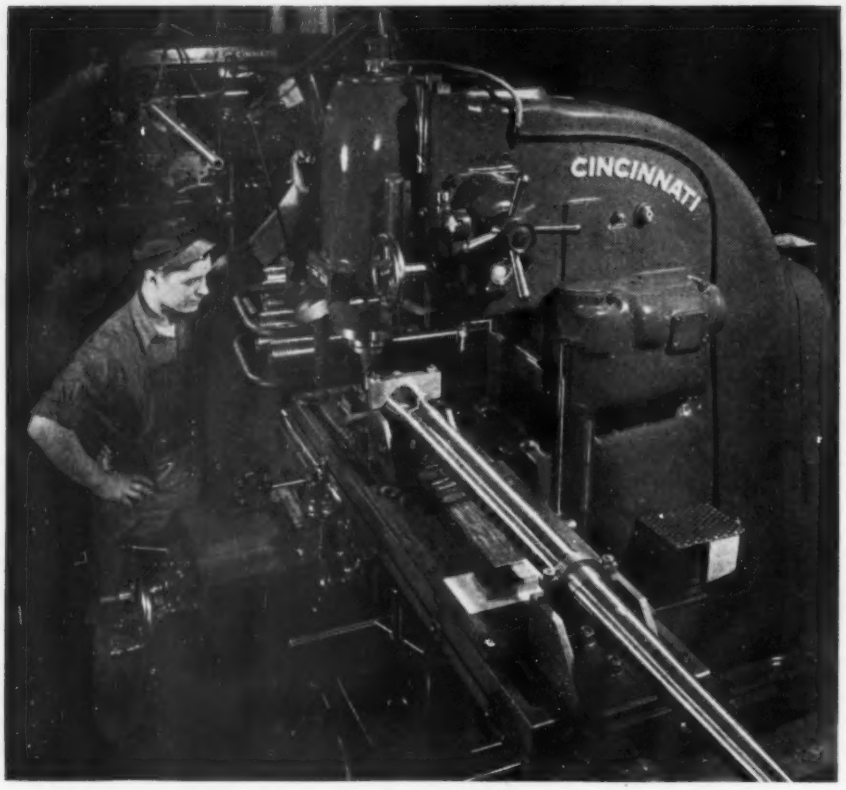
Promises Don't Count

The technicians are aided by control men whose job it is to follow all work in process. They make a daily report on every part including tools, jigs and gages. No front office promises for delivery are accepted from anyone. The control men go right into the shop and see for themselves just what progress is being made at every step in the schedule.

It is natural to find that many small shops are not accustomed to planning. In peacetime they found it easy to go across the street to a supply house and pick up a cutter when it was needed. Such conditions do not exist today; tool and gage deliveries take months. Consequently every need must be foreseen, and all orders placed well in advance.



The Flow Chart on a typical war product shows the shipment of parts to the prime contractor's assembly plant and thence to the government procurement agency



Barrels are made in a new plant operated by the prime contractor, but most of the smaller components are subcontracted

It is saying nothing against the management of a great many small shops to point out that they are not accustomed to anticipate such needs. The important point is that the prime contractor can leave nothing to chance. He alone is responsible for the delivery of the assembled product on time and to government specifications. He can never use the failure of one of his subcontractors as an alibi for lateness or for poor quality.

Field Man Controls Schedule

As an example of how thoroughly American Type Founders' field men cooperate with subcontracting plants, one of the control men is now acting as production manager of such a plant. He has complete charge of scheduling and follow-up all of the plant's output whether it is on a subcontract for his own concern or not.

Naturally the number of field men varies greatly in each plant in accordance with the amount of work it is handling and the size of the organization. There may be a dozen such men in a plant continuously, or one man may visit a number of smaller plants giving only a portion of his time to each one. Women as well as men are used for this work.

There is no question about it—subcontracting takes time, requires careful planning and costs money. Rigid follow-up and supervision of all phases of each job adds to the unit cost of operation. But it puts men and equipment to work more effectively than any other plan that has been proposed to date.

Capital Outlay Saved

On one aircraft parts job alone, 1,100 machine tools valued at $6,500,000 were located and put to work. This sum has been saved to the government and the nation's taxpayers by avoiding new capital investment for these machines. In addition the equipment so located was already set up and in place, eliminating time lost and the engineering work involved in planning and building new plants of equal capacity. The Army and Navy will get much needed military equipment more quickly through the use of these existing facilities. And last but not least, a large number of small shops unable to fill the status of prime contractor are put to work instead of closing their doors and going into bankruptcy.

Let us look at a few of these shops that have benefited by American Type Founders' policy of spreading its orders. Some of these are subcontractors and some are in the next bracket—sub-subcontractors.

A manufacturer of metal buttons turned his press equipment to the manufacture of electric terminals for aircraft instruments. He was supplied with dies for this work as the shop equipment was suitable for the job. The shop employs 30 men.

Other Shops Benefit

A ten-man shop formerly making knitting mill equipment is now busily engaged in parts for an airplane starter. Another proprietor employing six persons, mostly girls, did a jobbing business with his office in his home and manufacturing equipment in his barn. He is now making solenoid plunger assemblies.

A former supplier of cotton-mill equipment parts, with a 20-man shop in Connecticut, is now making terminal posts and other screw machine parts.

Another plant which in peacetime makes floor finishing machines, employing 40 to 50 people, is now making a number of parts for a target designator. A Philadelphia concern, which formerly employed 20 men in reconditioning old machine tools, now employs 60 persons in making parts for a 3-in. gun. Another concern employing 30 men and women made spiral binding for notebooks and bridge pads in a New York loft building; now it is making a clutch spacer.

An oil-burner service man had a lathe and a drill press in the 14x14 ft. cellar of his New Jersey home. He now employs eight men and has added new machine tools to make four important ordnance parts. He is now moving into larger quarters.

A larger plant in Long Island City, employing 125 people, made ornamental lamps and cornices as its peacetime products. It is now furnishing stampings to American Type Founders and to other prime contractors in the vicinity.

Fine Spirit Shown

Invariably the spirit shown by these subcontractors is excellent. They will work day and night if necessary to maintain schedules and spare no expense to meet quality requirements.

Many of the small subcontractors are in the New York metropolitan area which has been called the "ghost town" of this war because of the difficulty in converting the small shops in this vicinity to war work. American Type Founders has done a lot to remedy this condition and as a result their $4,000,000 peacetime business has expanded into a $34,000,000 wartime business, every bit of it going to Uncle Sam or his allies.

Design Standards for Roller-Turner Tools

BY R. D. MACK, CARBOLOY COMPANY, INC.

Wartime application of carbide roller-turner tools to turret lathe work has brought to light certain rules of use and grinding

AS RAPIDLY as the use of carbide tools has become accepted practice for any specific type of application, such tools have been either standardized for mass production or have become design standards in the carbide tool industry.

Among recent design standards are the roller-turner tools intended for use with Warner & Swasey and Gisholt turret lathes. The demand for such tools has been unusually pronounced during the past year as the result of the many bar stock turning operations required in the manufacture of war products.

The basic principles of application of carbide-tipped roller-turner tools do not differ fundamentally from accepted carbide tool application practice. The following factors must be taken into consideration, however, if such tools are to be used at maximum efficiency.

Carbide roller-turner tools should be set on a radial centerline of the work or slightly above, but never below the centerline. Tools set below center will have excessive front clearance and insufficient support under the nose. Tools set too far above the center will have insufficient front clearance, resulting in excessive tool wear.

Unless a diameter must be turned accurately concentric with a previously finished diameter, the rolls should be set to follow the tool. With this practice the rolls help to produce a good finish on the work.

To make certain that the rolls ride on a finished and smooth cylindrical surface, and engage as soon as possible after the tool starts to cut, they should be set from 1/64 to 1/32 in. behind the high point of the nose radius of the tool.

To determine whether pressure of the rolls against the work is correct, place the thumb against the rolls with the work revolving and the feed disengaged. A light thumb pressure should prevent the rolls from turning when the roll pressure is properly adjusted. With insufficient or uneven pressure the work is likely to be forced out of line by the pressure of the cut.

Cutting speeds and feeds customary with carbide tools on lathe work are satisfactory for roller turning. In general, the cutting speed for steel should be over 200 ft. per min., the feed 0.015 to 0.030 in. per revolution. The speed should be kept sufficiently high to produce a shiny finish on the work. Too slow a speed will leave a ragged surface and the tool life will also be shortened.

To obtain a fine finish on the work the feed may be decreased to 0.008 to 0.012 in. Feeds less than these values will subject the tool to more wear due to the increased rubbing action.

Although the design of Carboloy roller-turner tools for only Warner & Swasey and Gisholt type lathes has now been standardized, the same design principles apply to tools for other machines. The major differences will be in tool shape details controlled by the sizes of, and the angles incorporated in, the tool slot of the roller turner used.

For illustrative purposes the "standard" design roller-turner tools for Warner & Swasey lathes will be dealt with in detail.

The standard tool design for turning to a 90-deg. shoulder is shown in Fig. 1. The cutting edge forms a 3-deg. angle with the shank. This angle is necessary because the tool shank is held at a compound angle in relation to the work. Fig. 2 similarly illustrates an 8-deg. angle at the cutting edge to produce a 5-deg. lead angle with relation to the work. This angle is desirable for heavy cuts when a 90-deg. shoulder is not required.

The other tool angles shown are such as to produce the recommended back rake and front and side reliefs when the tool is set on center or slightly above. With tools held in this manner, the effective back rake will be approximately 5 deg. and both front and side relief will be approximately 7 deg. The 5-deg. back rake helps chip flow away from the tool and reduces the possibility of chips interfering with the rolls. This advantage is especially ignificant when turning small-diameter work where the space between the tool and the rolls is limited. Fig. 3 shows the tool settings that obtain because of the compound angle of the toolholder. The nose radius should be approximately 1/64 in. for maximum tool life.

Roller-turner tools are used today almost exclusively for cutting steel. For this operation they must have a chip breaker to coil the chip and direct it away from the tool and rolls.

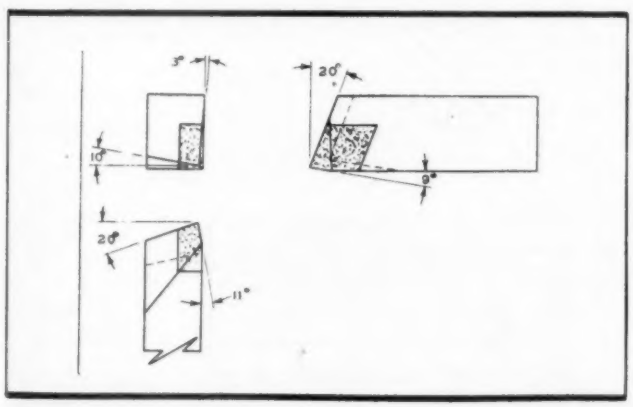


Fig. 1—As applied to a Warner & Swasey lathe for turning to a 90-deg. shoulder, the cutting edge of the roller-turner tool is placed at a 3-deg. angle to the shank

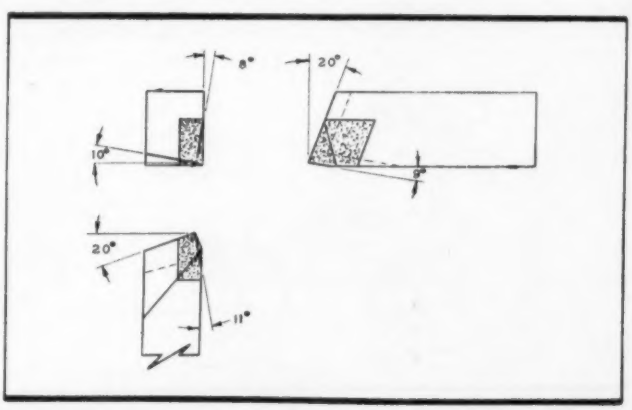


Fig. 2—For heavy cuts, where turning a square shoulder is not required, an 8-deg. angle on the cutting edge produces a 5-deg. lead angle with relation to the work

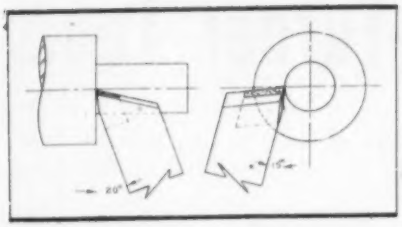


Fig. 3—Because of the compound angle of the toolholder for the roller-turner tool, these angles apply in tool setting

Ground-in chip breakers similar to those used in some high-speed steel roller-turner tools are practical for carbide roller-turner tools. The side rake angle is easily incorporated in the chip breaker surface of these tools.

Two common styles of chip breakers are illustrated in Figs. 4 and 5. The gullet type, shown in Fig. 4, is effective in directing the chip away from the work. Any nicks in the cutting edge developed during the grinding of the faces will be removed by the grinding of the land. The ledge, or "step"-type, chip breaker, Fig. 5, has the advantage of being simple to grind.

Dimensions shown in Figs. 4 and 5 for various cuts and feeds are intended to be guides only. Minor deviations are necessary to suit steels of various grades and hardnesses.

The sharp edge at the shoulder of the chip breaker should always be removed with a hand hone. A sharp edge will scrape fine shavings from the chip. These shavings tend to spoil the finish of the work when they are carried between the work and the rolls.

The sequence of grinding operations for tools having chip breakers, as in Fig. 4, should be:

1. Relieve steel from the vicinity of the surfaces to be finished.
2. Grind front and side relief or clearance surfaces.
3. Grind chip breaker.
4. Grind land and top face.
5. Grind nose radius.
6. Hone front edge of tool and shoulder of chip breaker to remove sharp edges.

The sequence of grinding operations for tools having chip breakers, as in Fig. 5, should be:

1. Relieve steel from vicinity of surfaces to be finished.
2. Grind top face.
3. Grind chip breaker.
4. Grind front and side relief or clearance surfaces.
5. Grind nose radius.
6. Hone front edge of tool and shoulder of chip breaker to remove sharp edge.

To obtain the proper angles in all machine grinding operations, the tool should be held in a universal vise or in a special fixture which automatically presents the tool to the grinding wheel at the angles required for the individual roller turner used.

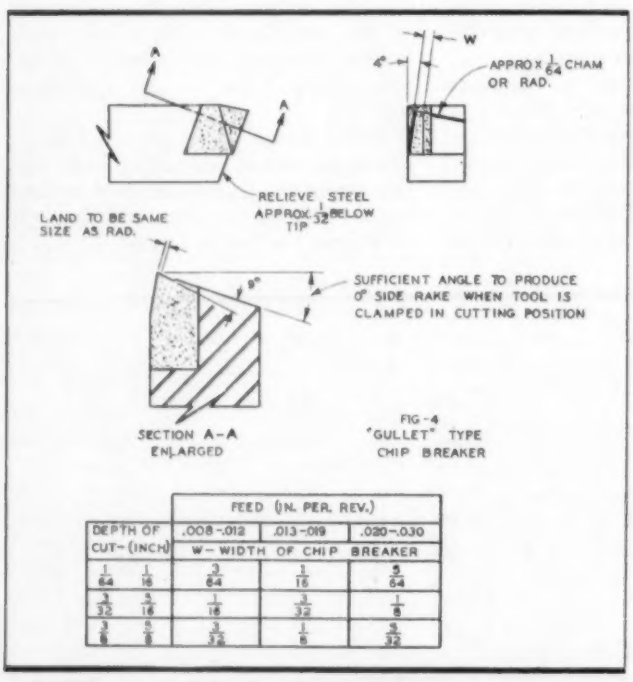
The front and side relief or clearance surfaces should be ground on a 100-grit silicon carbide or diamond wheel of the cup type. This can be done by hand or machine grinding. Time may be saved, where a large amount of carbide must be removed, by hand grinding on a 60-grit silicon carbide wheel. For relieving the steel, an aluminum-oxide wheel on a pedestal grinder should be employed.

The chip breaker should be ground on a small tool and cutter grinder or a chip breaker grinder, using a 100-grit straight diamond wheel. The wheel should be fed vertically into the tool at a feed greater than 0.0005 in. per pass.

The top face can be ground by using the same machine and 100-grit diamond wheel. An advantage of this practice is that it will help prevent the wheel from developing a crown.

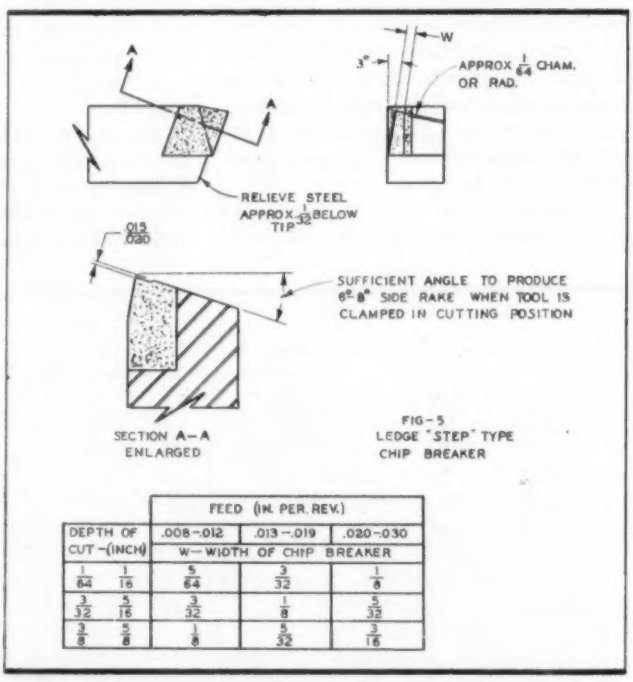
To produce a smooth land and a keen edge in grinding the top face of tools shown in Fig. 4, the wheel should be set at right angles to the cutting edge and the direction of rotation against this edge. For tools not having a land, as in Fig. 5, the wheel orientation and direction of rotation is optional since the cutting edge lies below the top face.

The nose radius should be ground by hand. A good even curve can be formed by grinding several small flats approximately tangent to the radius and then using a hand hone to round off the high points.


W
4°
APPROX 1/64 CHAM OR RAD.
RELIEVE STEEL APPROX 1/32 BELOW TIP
LAND TO BE SAME SIZE AS RAD.
9°
SUFFICIENT ANGLE TO PRODUCE 0° SIDE RAKE WHEN TOOL IS CLAMPED IN CUTTING POSITION
SECTION A–A ENLARGED
FIG-4 "GULLET" TYPE CHIP BREAKER

DEPTH OF CUT–(INCH)		FEED (IN. PER. REV.)		
		.008–.012	.013–.019	.020–.030
		W–WIDTH OF CHIP BREAKER		
1/64	1/16	3/64	1/16	5/64
3/32	5/16	1/16	3/32	1/8
3/8	5/8	3/32	1/8	5/32

Fig. 4—With a gullet-type chip breaker the cutting edge is at the same height as the top of the tool but the two faces are at different angles

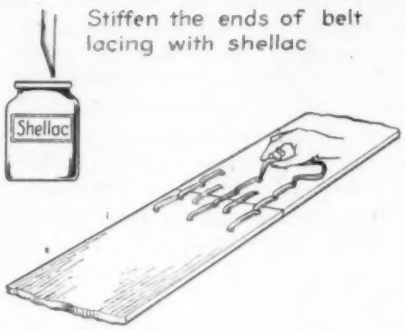

W
3°
APPROX 1/64 CHAM. OR RAD.
RELIEVE STEEL APPROX 1/32 BELOW TIP
.015 .020
6°-8°
SUFFICIENT ANGLE TO PRODUCE 6°-8° SIDE RAKE WHEN TOOL IS CLAMPED IN CUTTING POSITION
SECTION A–A ENLARGED
FIG-5 LEDGE "STEP" TYPE CHIP BREAKER

DEPTH OF CUT–(INCH)		FEED (IN. PER. REV.)		
		.008–.012	.013–.019	.020–.030
		W–WIDTH OF CHIP BREAKER		
1/64	1/16	5/64	3/32	1/8
3/32	5/16	3/32	1/8	5/32
3/8	5/8	1/8	5/32	3/16

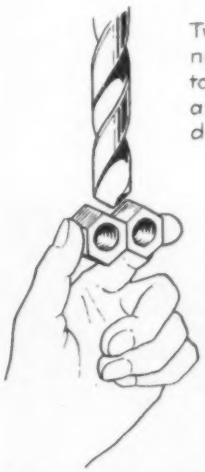
Fig. 5—With the step-type chip breaker the top of the tool is above the cutting edge and is parallel to the top face of the chip breaker

SHORT CUTS FOR THE SMALL SHOP

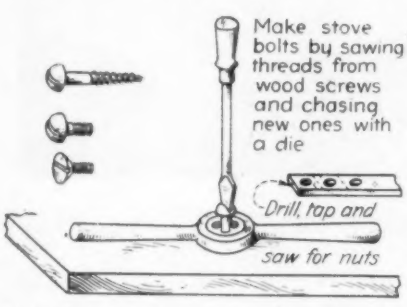
BY A. H. WAYCHOFF



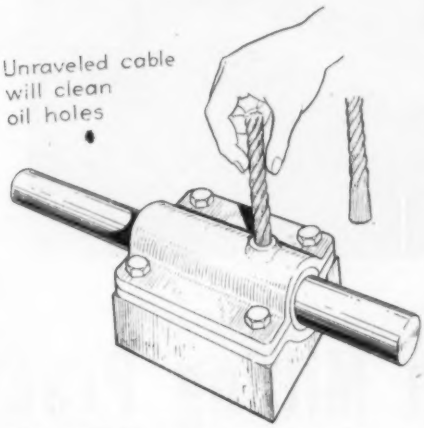
BELT LACING can be threaded easily if the pointed ends are first dipped in shellac or lacquer. The points will then stay stiff, and once started through the belt can be pulled through with pliers. An awl or pointed stick need not be used.



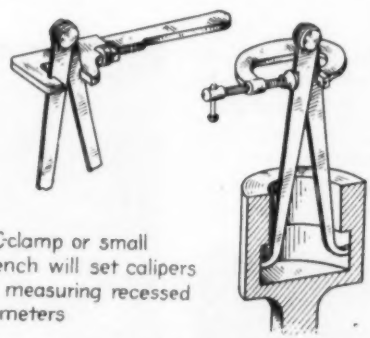
DRILLS should have accurate point angles to give best performance. Small shops not equipped with drill gages can check the point angle on a drill by placing it in the V formed by holding two hexagonal nuts together.



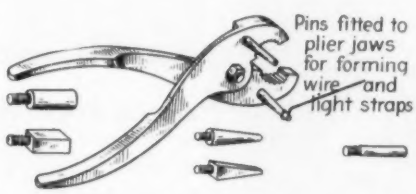
SMALL BOLTS with machine threads can be made from wood screws by sawing off the original threads and running new ones on the screw shank with a button die. The same thing can be done with nails after slotting the heads with a hacksaw. Lay the button die on the bench and use a screwdriver to run the threads. Nuts can be made by drilling, tapping and sawing strap iron.



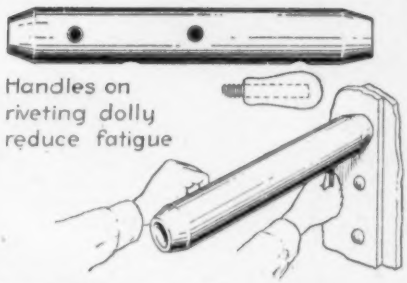
OIL HOLES can be freed of dirt and gummed oil residue with a piece of cable, a short end of which is unravelled. The cable is particularly useful when heavy grease has to be cleaned from bearings.



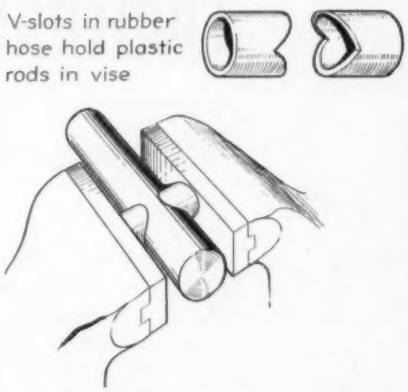
CALIPERS with the screw removed and notched on each leg to receive the feet of a small C-clamp will be suitable for measuring recesses and overhanging work. After the recess has been measured with a setting of the C-clamp, close the caliper, remove it from the recess, and reset its legs in the clamp. A small monkey wrench can also be used.



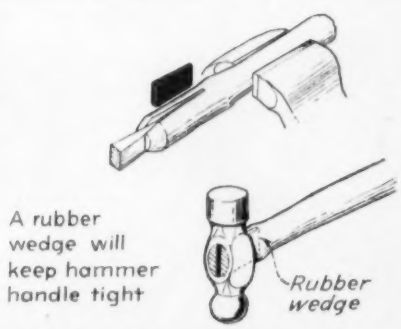
PLIERS can be drilled and tapped on the side for auxiliary jaws to form wire and light strap metals. The jaws are drilled and tapped for 3/16 in. threads. Run threads up to a shoulder on the ends of the auxiliary jaws.



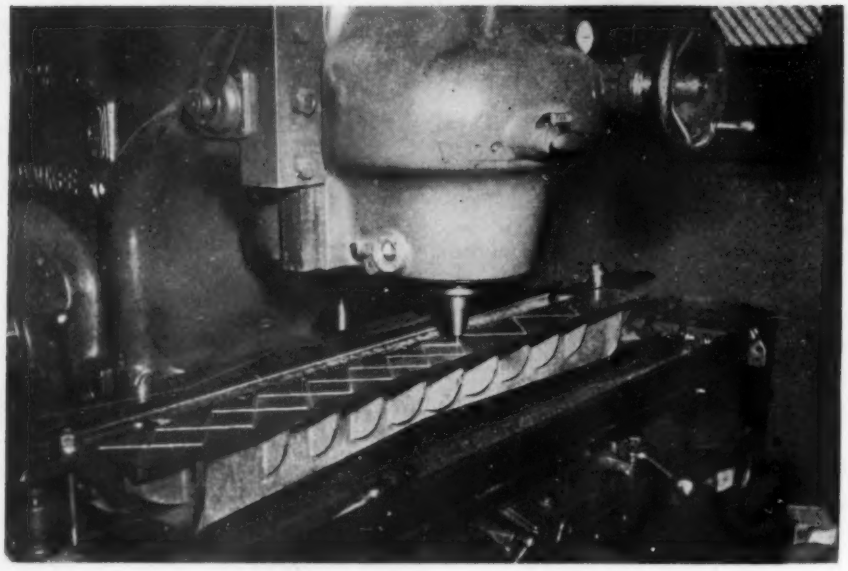
RIVETING DOLLIES, made of 3 to 4 in. diameter steel weighing up to 50 lb., contribute to operator's fatigue. T'at can be minimized by drilling and tapping a series of holes around the dolly for insertion of handles. The position of the handles can be adjusted to suit each job.



PLASTIC ROD and tubing will break if held tightly in a vise, even if backed up by a resilient material. Danger of such breakage can be minimized by cutting V-slots in short lengths of rubber hose and using them between the vise jaws and the plastic rod.



RUBBER WEDGES can be used to keep hammer handles permanently tight. Make the small rubber wedge and place it in the hammer handle slot, which is sawed deeper than usual. Chamfer the end of the handle to about 45 deg., and drive it into the hammer. The pressure exerted by the compressed wedge will keep the handle tight. The chamfered end can be sawed off flush with the hammer.

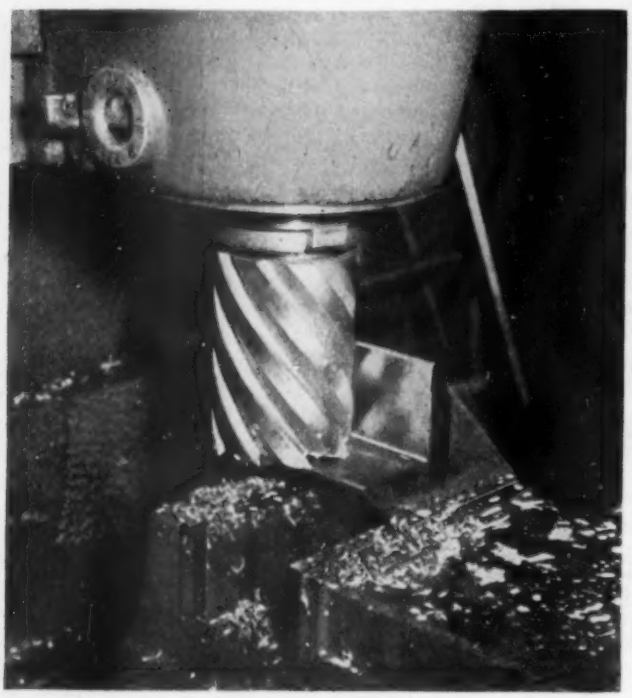


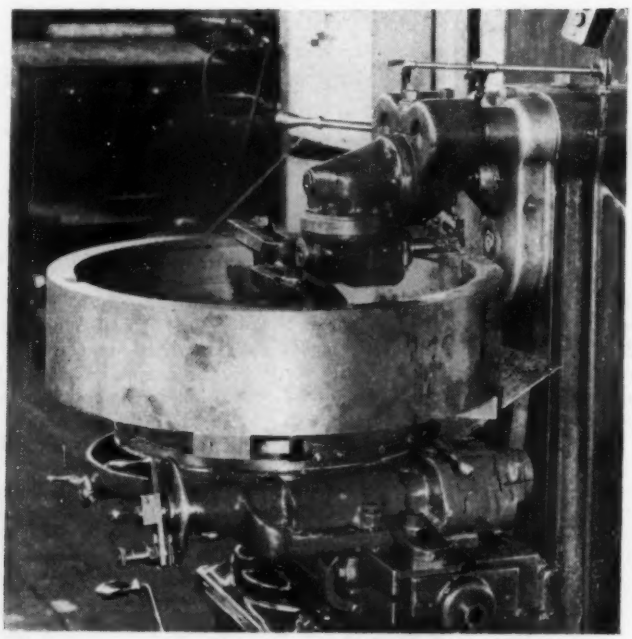
Diagonal channels in plates can be milled by engaging longitudinal and cross feeds simultaneously. A ball end mill is used. If the channels are at 45 deg. angles, the longitudinal and cross feeds must be equal. For any other angle, the trigonometric relationship between the feeds establishes the feed rate of the one if the other is given or selected. Grooves here are being milled in a lapping plate. Such channeling will relieve strains in the plate surface to insure greater continued accuracy

Toolroom Milling Practice—I

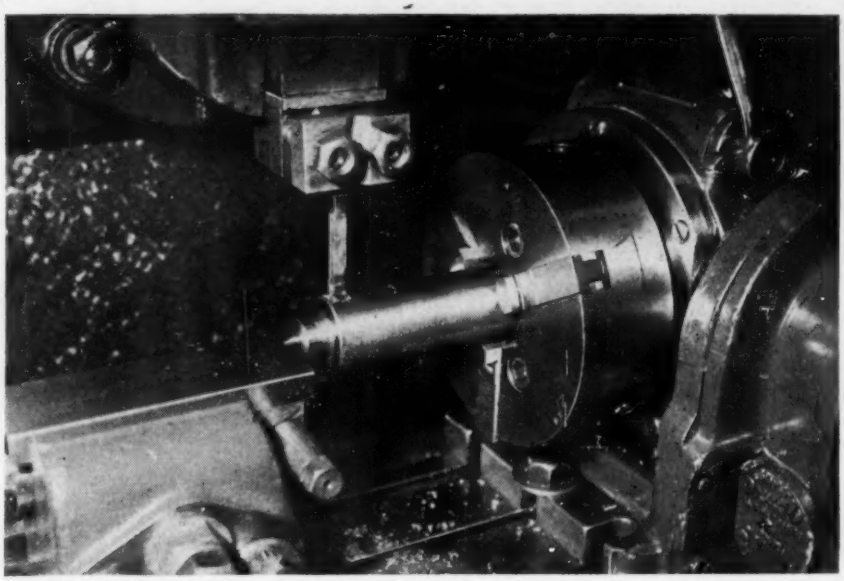
BY H. A. FROMMELT, KEARNEY & TRECKER CORPORATION

V-blocks which have first been machined square on all sides and have the V laid out on one end can be set up to cut both sides of the V simultaneously with an end mill. The diameter of the end mill should be slightly greater than one side of the V. The laid out block should be set in the vise with one side of the V horizontal, using a surface gage. The thrust of the cut should be toward the jaw of the vise



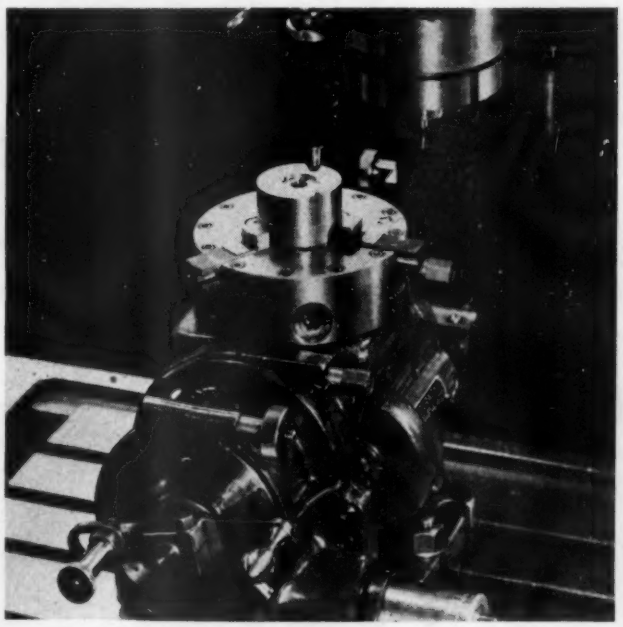


Internal keyways may be machined on a standard milling machine equipped with a universal attachment. The keyways in this ring, which are ½ in. deep, 1.001 to 1.002 in. wide and spaced accurately at 180 deg., are cut with a 1 in. end mill. Spindle speed is 250 r.p.m., and the feed is 1½ in. per min. A test bar is used to establish the proper relationship between the end mill and the ring. Since clamps must be placed inside the ring, the knee of the machine is lowered to index the table for the second keyway



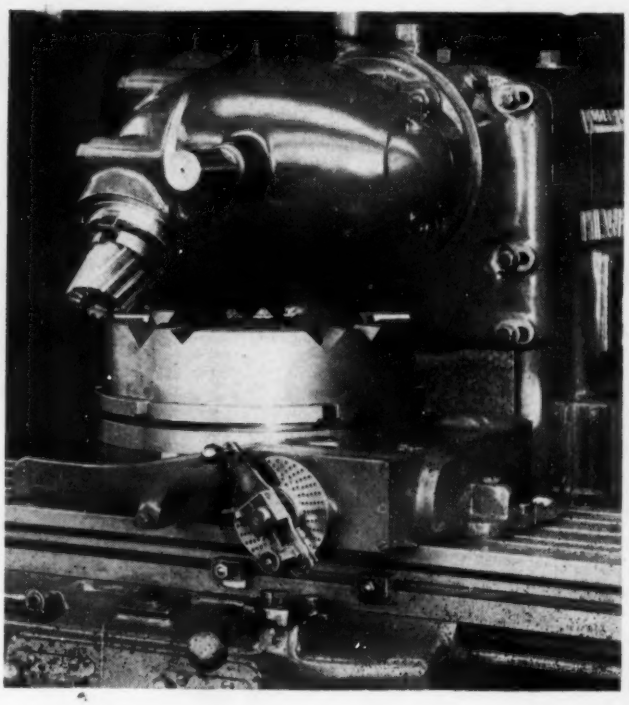
Square holes can be cut on a milling machine equipped with a slotting attachment. The ram of this device, powered through the spindle, carries a form tool for slotting internal keyways, cutting gears or, as shown in this illustration, machining a square hole in a boring bar. The bar can be held either in a dividing head or chuck and supported on the other end in a tailstock. Holes in such bars should be first drilled about 3/16 in. larger than the size of the slotting tool

There may be more than one way to set up work in a milling machine. Usually, however, one of the ways is more efficient than the others, resulting in greater accuracy and faster production. Typical examples of specific and proved set-ups that are applicable to a variety of jobs are shown here



Optical measurements are used when it is difficult or impossible to check tool settings with the usual instruments. Here a Center Scope, a machine shop microscope, is held in a fixture mounted rigidly to the machine spindle and is being used to locate the spindle and the tool accurately with respect to the workpiece. The distance the table travels from one side of the cavity to the other, as visible in the microscope, is measured on graduated scales and micrometer rods. The tool is then set to these measurements

V-slots in this ring are 1¼ in. deep and spaced on 72 deg. centers. The smaller slots are ¾ in. deep, are located 27 deg. from the large slots, and are also spaced on 72 deg. centers. All slots have a 90 deg. angle. They are milled with a 3 in. cutter set at 45 deg. The ring is set up on a hand-feed rotary table utilizing an indexing plate to locate the five large and five small slots in turn under the cutter



Precision Tests for Ball Bearings

BY C. E. STOODLY, SCHENECTADY WORKS, GENERAL ELECTRIC COMPANY

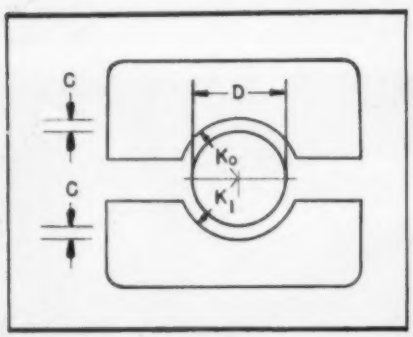
Carefully planned inspection devices show the radial play, end play and sensitivity of ball bearings for instruments

IN PRECISION INSTRUMENT manufacture the relationship of rotation input to rotation output must be held to close tolerances. To reach this objective, rigid inspection standards are required on all shafts, bearings and other essential parts of the instrument.

The following inspection procedure has been used for bearings covering a range of sizes from 3/16 to 2½ in. outside diameter with gratifying results. Some 200,000 bearings were handled in this way.

In the inspection of ball bearings, the measurable quantities dealt with in this article are radial play, end play and sensitivity or stickiness.

Let us consider radial play. It has been stated among ball bearing manufacturers and engineers that radial play may be calculated from the formula:



$$C = \frac{E^2}{4\,(K_0+K_1-1)\,D}$$

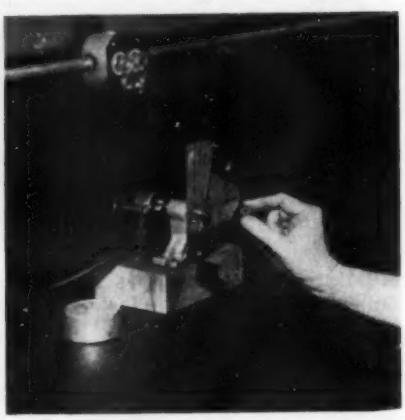
Where:

C=radial clearance
E=corrected end play (corrected load deflection)
K_0=outer rim curvature (percent of ball diameter)
K_1=inner ring curvature (percent of ball diameter)
D=ball diameter
4C=total radial play

This in all probability is true if the percentage curvature of the raceways, both inner and outer, is held to close

A ten-thousandths indicator reads the radial play

When using the end-play measuring device the load is applied to the inner race



Dampening vanes prevent oscillation of the pendulum on the sensitivity indicator

tolerances through the whole circumference of the raceway. In addition, the ball diameter must be held throughout its whole spherical surface to close tolerances. With present-day manufacturing methods, for a given fit-up, radial play varies over a wide range while end shake remains fairly constant.

Radial play is checked in a fixture (Fig. 1) that holds the inner race of the bearing secure with no spring in the holding device. Then a predetermined weight is brought to bear on the outer race both above and below the bearing. By making the lower weight (2W) twice the upper weight (W) and removing the lower one, radial play may be read directly over the center of the outer raceway as a difference reading with a ten-thousandths indicator. The weight applied to the bearing must be determined by experiment for that particular size.

A graph can be made with radial play on one axis and weight shown on the other axis. By constantly increasing the weight and plotting points on the graph, a point is reached where compression of the outer race becomes apparent when measuring with a ten-thousandths indicator. Plotting a quantity of bearings of different radial play gives a family of curves.

A weight point is picked on this family of curves that is midway between the point where the readings are erratic, because of the friction pressure angle of the balls in the raceway, and the point where compression becomes apparent. Radial play is to be construed in all cases as the reading taken with the indicator weight directly over a ball. If a reading were taken over a point between balls some bridging and compression would be read. With a fixture of this type, concentricity of the assembled bearing measured on the outer race may also be read by removing the lower weight and revolving the outer race.

After bearings have been sorted as to radial play, they can then be used according to their classifications.

Bearings can be inspected for end play in a fixture (Fig. 2) that clamps the outer race and applies weight downward (W) and upward (2W). The upthrust weight is twice the weight of that pushing downward. End play can be read directly on a thousandths indicator.

Some applications may be encountered where radial play, end shake and concentricities will not cover the entire scope of requirements. Sensitivity or stickiness is a factor where input has a low torque magnitude. It is then necessary to measure sensitivity.

The checking device shown in Fig. 3 is used to check torque of the magnitude of 0.001 inch-ounces.

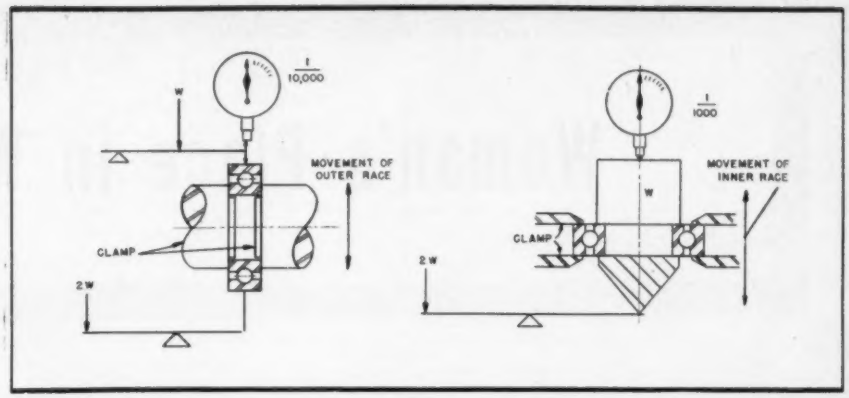


Fig. 1—With the inner race held fast, the load weight is applied and released to determine radial play

Fig. 2—End play is found by a similar manner except that the bearing is clamped horizontally

The bearing inner race is driven at a constant speed through a mandrel by a Telechron motor running at 60 rpm. A small pendulum-like device is clamped around the outer race with slight pressure. One arm of the pendulum is extended upward to form the pointer of the device to indicate against a scale, and the lower portion is weighted.

The scale can be calibrated directly in inch-ounces or in numerical units, the torque being equivalent to the sine of the angle in radians multiplied by the weight of the pendulum at 90 deg. in inch-ounces.

It is necessary to damp this device by some means to prevent it from oscillating as a free pendulum, as minute impulses within the bearings will start it oscillating. An air damper is used consisting of two identical vanes attached to the ends of the pendulum equipment from the center.

Standards may be set up from the application itself. By measuring the torque of units that are satisfactory, and by measuring units that are on the threshold of acceptance, a standard of acceptance may be set up.

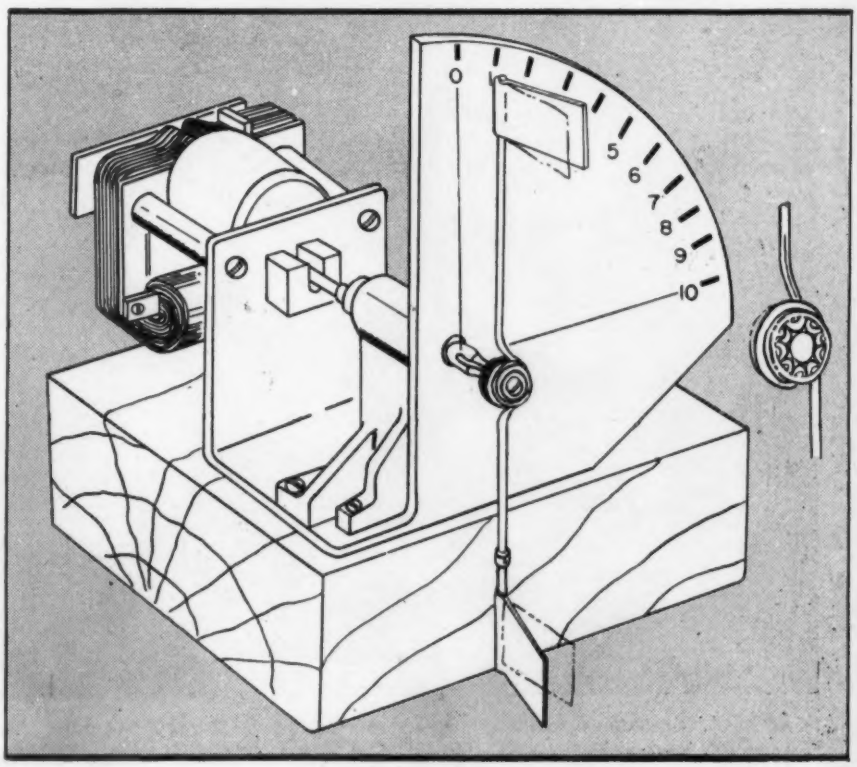


Fig. 3—The sensitivity checking device has an electric clock motor drive and an indicator calibrated in inch-ounces

Woman's Place in War Work

War-necessity brought thousands of women into industrial employment, placed them in positions formerly considered suitable only for men. And they're making good!

A 24-hour, four-point training course for Lodge & Shipley Machine Tool Company's new women workers gives them sufficient basic training to make them specialists on certain machines. Above, they are taught to read mechanical drawings

JUDGING from the pleased, and sometimes faintly surprised, statements of many production executives, womanpower is here to stay, like the horseless carriage and universal suffrage. The die-hards in the shops and assembly lines—if any remain unconquered by feminine efficiency and charm—might as well decide to like it. Yes, and the men in the jobs from which requirements of strength and endurance have excluded women, might as well prepare for mechanical changes making possible the hiring of the gentler sex.

Fourteen women in the foundry molding machine division of The Osborn Manufacturing Company "are standing shoulder to shoulder with men on these jobs," writes R. W. Hisey, vice president. "The work that they turn out is equal to that of the men in both quality and quantity."

The George S. May Business Foundation reports, "Women were found to be more proficient than the average man operator in miscellaneous bench assemblies, sorting and handling rivets, punch press, miscellaneous burring and reaming, spot welding, trim shop and drill press operations."

There Are Limitations

The main limiting factor to the employment of women seems to be their comparatively less endurance and resistance. States the Women's Bureau in its Labor Bulletin 189-1, "In most departments there are jobs deemed not suitable for women, either because the work is beyond the average woman's physical strength (570/1,000 that of man) and resistance (679/1,000 that of man), or because the work requires lengthy experience and training which the emergency does not permit."

But, declares Miss Mary Anderson, director of that Bureau, "Our industrial surveys show that no real distinction exists in war industries as to what constitutes a man's or a woman's job."

In some instances the work of women is better, as witness the findings of the War Production Board when it

compared the work of women diamond die makers. Plants which employ a considerable proportion of women were shown to be turning out equal or better dies than all-male outfits.

Before the women can produce these results, they must be recruited, selected, trained and fitted into properly selected jobs.

Faced with labor shortages, many companies have turned to interesting devices to attract the attention and hold the interest of prospective employees. Some have established branch employment offices in busy sections of nearby communities, others have set up miniature shops in such locations, where women employees demonstrate the types of work available. One company purchased full-page newspaper advertising space, published a statement, signed by the paper's society editor, urging women to enroll for war production, suggesting they make contact either with her or the company employment office. In another community, the Chamber of Commerce supported an all-out drive for women workers for the local industries.

Chase Brass & Copper Company has found success in obtaining employees through contacts with women's clubs and church groups, writes Ellen M. Davies, personnel director, in Executives Service Bulletin of the Metropolitan Life Insurance Company.

Continuing, she lists the classifications into which most women recruits fall: young women who each year come as new recruits to industry, due to age; married women without dependents and married women whose husbands are in the armed forces; older women who have been successful homemakers, teachers, librarians, secretaries, and who feel that they should reenter the industrial and technical services; women from minority groups such as aliens and others; and women who may be physically handicapped and partially disabled.

The selection of women workers for jobs previously held by men requires an alteration of the personnel manager's standards. He must make allowance for their lower resistance and less strength; he must consider their reaction to surroundings of a type to which they have not normally been accustomed and to routines which may be tiring both physically and mentally.

On the basis of a survey of three large war production plants, War Manpower Commission reported, "Initial selection [of women] for employment is made on the basis of personal qualifications, as revealed through information on the application form and an interview with a personnel officer. During the personal interview, an effort is made to discover home responsibilities and conditions which might affect the ability of the candidate to be on the job every day. Concern over absenteeism led personnel officers in all three plants to stress this point. Mothers with young children are discouraged from accepting employment unless they prove that there is someone in the home to care for the children. Until adequate nursery and after-school care is provided, it is not thought wise to hire workers from this group.

"Physical examinations are a requirement and placement to various departments is based on such physical qualities as eyesight, height, or strength, and size of hands."

Atmosphere is Important

Plant managements have found it expedient to furnish their women employees with bright, sunny lounges, clean working surroundings, day nurseries, beauty parlors, women counselors and special shift arrangements.

Training courses have taken on the task not only of instilling in the new women employees' minds the basic facts of the jobs they are to do, but also of introducing them to shop life with the least possible confusion. Courses vary from the extremely simple in nature, to the all-inclusive and highly detailed; an instance of the former is Lodge & Shipley Machine Tool Company's "Four Point Training for Women," while Eastern Aircraft Division's engineering courses for women college graduates is an example of the latter; each was detailed recently in these pages.

The Lodge & Shipley program takes the entirely untrained, but intelligent, worker and seeks to train her in four basic aspects of shop work, while seeking, through shop visits and work periods, to induct her into the "feel" of things. The program seeks to give merely the essential training to each woman, that she may become a smoothly functioning cog in the production machine.

At the other end of the scale, Eastern Aircraft Division seeks capable women college graduates, pays them $130 per month, plus overtime, and gives them an intensive twelve-weeks course in engineering drawing, mathematics to trigonometry, mechanics, metallurgy, and specifications. When they complete the course, they're ready to step into positions as artists, draftswomen, tool designers, time study, and specification writers.

In-plant up-grading courses are not uncommon. Package Machinery Company conducts an hour-and-a-half "visualization" class each morning for girl tracers in the engineering department. Classes are intended to give them a better understanding and appreciation

Women workers have proven adept at fine assembly jobs, while showing an ability to do repetitious work without lagging. At Vega Aircraft Corporation's Burbank plant, scores of women perform precision and detail assembly jobs, as these shown soldering wires into plugs

The second generation is on the line. A mother and daughter work side by side in Westinghouse Electric & Manufacturing Company's Philadelphia plant

Women are succeeding in jobs previously held only by men. The worker above torchwelds the tail plug flange in a droppable fuel tank at a Lockheed plant

of their work, stimulate interest, eliminate mistakes and build morale. When the girls complete the course, they are expected to develop from tracers to detail work.

The War Department has issued a booklet, "You're Going to Employ Women," in which it advises, when training, "Orient her more thoroughly than a man in health and safety rules, plant layouts and production policies, technique. Give her a preliminary training course to get the feel of the work. Relate her job training to past experience, usually domestic—interpret machinery operation in terms of household and kitchen appliances. Arrange for continuous upgrading and train her for higher grade jobs. Use Community training facilities when necessary—trade schools, vocational classes in college and universities."

Most women are unused to, or unprepared for, the din, grime and bustle of a machine shop or assembly line. Many of them seek employment because husbands have been called into the Army; others do it through patriotism. Whatever the cause, their new employment often is accompanied by problems of readjustment; to aid them in these, women counselors have taken their places on many plant staffs. These counselors help the new woman war worker with her personal problems during adjustment to industrial employment.

War Department's, "You're Going to Employ Women," gives advice to employers on hiring, training and supervising them. Included therein is the hiring advice: "Interview her for educational background, work experience, home obligations, for better placement. Give her a physical examination consistent with requirements of the job—special-test her for jobs requiring strength, tolerance of extreme temperature, or toxic substances such as benzol and lead. Test her for dexterity, precision, rapidity—trade skills. Favor (all else equal) the local resident without small children or infirm dependents. Mark potential forewoman material."

The increased use of women in a variety of formerly all-male jobs may be one of the permanent effects of this war. If true, it may be said that their influence will be a factor toward improving working conditions. As witness the recommendation made by the War Department in its previously mentioned booklet:

"Limit her hours to eight a day, 48 a week. Schedule rest intervals. Have diet-balanced luncheons available—and extra food on exhausting jobs. Provide good plant ventilation—work seats and benches at proper height—clean, orderly surroundings—safety devices on machinery. Insist on proper work clothing, safe shoes. Promote adequate housing and transportation."

Terms That Confuse

We are making some headway in getting makers and users of drills and reamers to use the correct term "helix" instead of the old and incorrect "spiral." The only real spiral is shaped like a watch mainspring or hair-spring, or the scroll plate used in some universal chucks. But even where we use the correct term, helix, we run into confusion in describing its "lead."

The term "fast" and "slow" are still confusing. To most of us, a fast helix means one in which the lead from one flute to the next is greater than in a slow helix, as in a screw thread. Some men, however, use it in the opposite way which is confusing to say the least.

Aviation—A Progress Report

The Lessons of War Become the Key to a Richer Peace

TUNISIA, PANTELLERIA, SICILY—stepping stones to momentous events! But that is not all. For they spell out across the blue waters of the Mediterranean a pattern of invasion that has progressed far since last summer's first major Commando operation against the French coast.

From Dieppe, you remember, too many of the raiders never got back. But in Tunisia, and on through Sicily, the Allied might plowed inexorably forward, winning objective after objective at a surprisingly low cost in casualties. Air supremacy over the battlefield? Yes. But we have learned, too, how to save lives and shorten the war by strategic air bombardment as a prelude to invasion.

Thus the bombardment plane—rarely seen by the doughboys on the fighting fronts—is destined to save their lives by hundreds of thousands in the decisive attacks that are to come. This fact is confirmed by the cold calculations of the responsible strategists. It will give renewed courage and confidence to every member of the armed forces and of the home fronts throughout the United Nations.

For instance: thorough strategic bombardment of an objective reduces by nearly fifty per cent the surface forces required for invasion. Anticipated losses are reduced from more than fifty per cent of the original ground force to about twenty per cent. Precision bombardment—as used on railroad objectives in Rome—reduces this percentage of loss still further when it is followed by offensive action on the ground.

This is the fifteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

The inference is clear. Effective prosecution of the war will require smaller ground combat forces and much larger air forces than some of our strategists once thought.

Our most urgent need, then, is for ever-mounting fleets of aircraft. And, fortunately, this is just what we are getting. The American aircraft industry now is producing as many airplanes as all the rest of the world combined. In 1938 we made 100 planes a month. Now we make three times that many in a single working day. By the end of 1943, our production rate will be about 10,000 a month.

But at this stage of the war, types of planes are more important than mere numbers. In the early months the program was heavy, and properly so, with single-engine trainers. Then, as training planes accumulated, the emphasis shifted to heavier types. Now we are turning out multi-engined bombers at a rate that is the envy of the entire world. Some months ago the President revealed that we were manufacturing 500 long-range bombers every month. The figure was conservative even then. And soon we shall be producing planes of this one type at a rate adequate to replace the normal losses of a fleet of at least 1000 American heavy bombers operating as continuously as the weather will permit.

A glimpse of the poundage production may help us still further to evaluate the miraculous achievements of the aviation industry as a whole. It was 89,000,000 in 1941 . . . 291,000,000 in 1942 . . . 911,000,000 in 1943 . . . and 1,417,000,000 in 1944

– if we need it. There you have the magnificent record of the American aircraft manufacturing industry – a monument to the cooperation of industry, labor, government, and to all-out teamwork between the aviation industry and those other industries which have converted their facilities to the manufacture of airplanes.

What of our enemies and our Allies?

German production probably has flattened out at 2500 a month – with downward revision in immediate prospect. Japan may be able to produce as many as 1000 planes a month – until we get our new long-range super-bombers in sufficient numbers to whittle down that figure. Italy may be able to turn out her 500 a month – for a little longer. At best the maximum Axis monthly total is 4000.

Add to our monthly score of nearly 8000, a total of approximately 4000 for Britain, Canada and Russia, and the United Nations score comes to 12,000 monthly. There we have a three to one advantage for our side. And between our own rising production and the brilliant operations of our bomber commands we should soon boost the ratio well above that figure. Therein lies the certainty of continued and growing air superiority over all the far-flung battlefields.

The critics of American airplane quality have been silenced ever since the ratio of enemy combat losses to our own on bombardment missions surpassed four to one. In the Pacific where our heavily armed and armored planes are knocking off the desperately stripped racing craft of the Nipponese, enemy losses often run as high as eight to one or more. In the Mediterranean theater, where the Italians were abandoned by their Allies, the story is much the same. Only in the well-defended homeland of the Nazis do we sometimes drop below the average, but even in those rare instances the ratio is still well in our favor and the effectiveness of our bombardment is adding constantly to our margin.

* * *

Behind the production lines the battle of research and design still rages. In many a laboratory night-shift, on many a secret test field, new and terrible surprises for the enemy are in the making. Super-bombers, destined for Tokyo, have long since passed out of the design stage and the Japanese may learn about them almost any day. New discoveries, designed to sow swift and silent devastation, are farther along than our enemies believe. No longer will fog or storm or night be permitted to fight on the side of our foes.

The men of science who are toiling to broaden the horizon of our knowledge stand today on the threshold of discoveries that have been sought for centuries. New reservoirs of power may soon exert a profound influence in many fields of technology and through them on our way of life.

Once the war is won these new discoveries will be translated into better living. No longer will countless thousands spend their lives within their own communities or countries. New efficiencies in transportation will bring world travel within the reach of many who once had to stay at home. New family vehicles will navigate the skyways as easily and safely as the highways. Already more than a dozen manufacturers of airplanes, ships, automobiles, and electrical equipment are designing, building, or flying rotary-winged aircraft such as the helicopter or autogyro to meet the needs of tomorrow's families. New and safer aircraft of the fixed-wing type are ready for production as soon as materials become available.

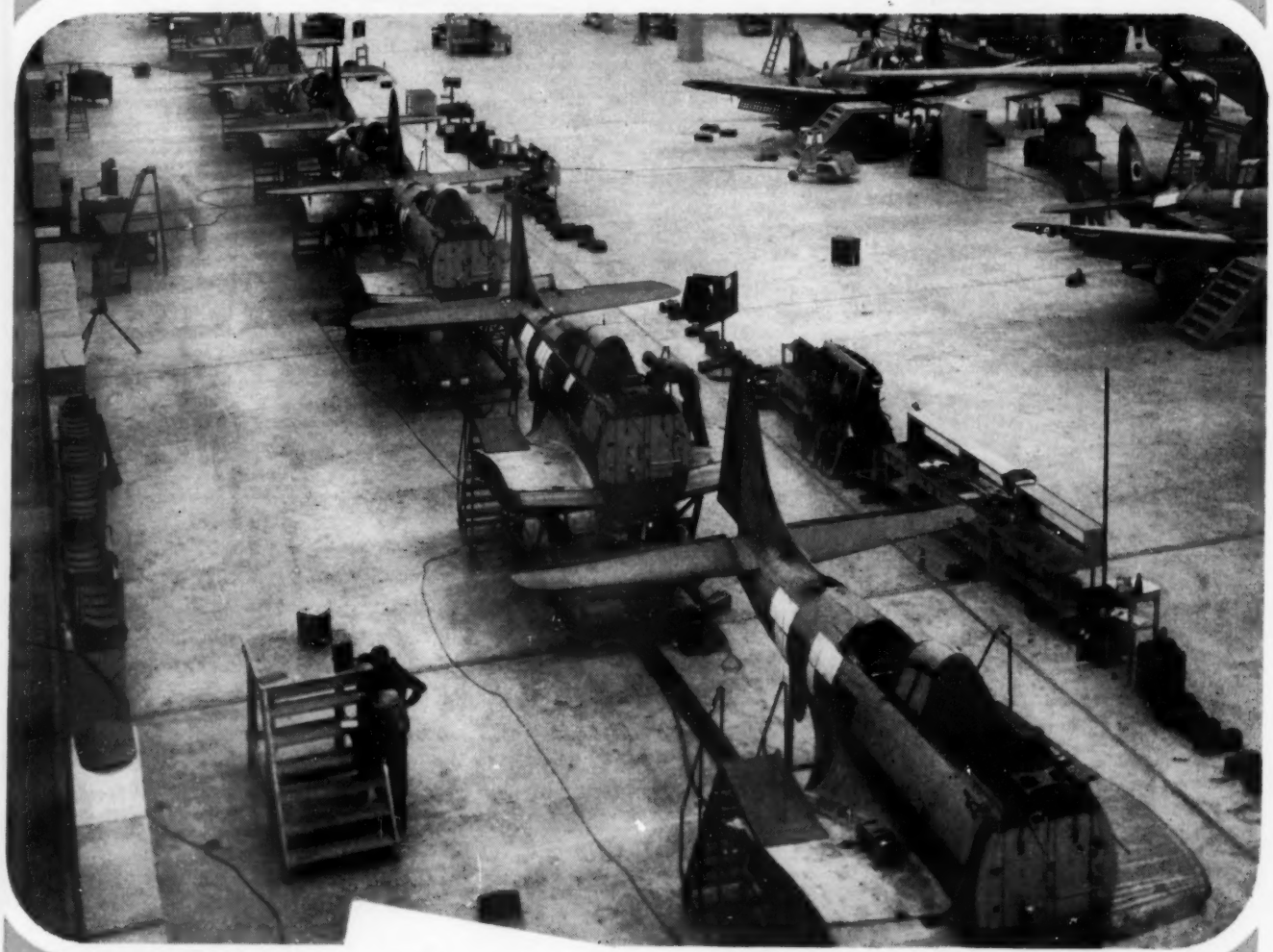
The quality that now makes each of our war planes worth so many of those built by our enemies will be translated into the sturdy reliability demanded by peacetime operation. The devices that seek out and find our enemies behind the veil of fog or darkness will, after the war, reduce weather hazards to the point where they will be no greater in the air than on the ground.

Science and industry will continue to do their jobs and do them well. But if the world is to be made a better place for men to live in, statesmanship must not fail to do its part.

President, McGraw-Hill Publishing Company, Inc.

Armament

SECTION OF AMERICAN MACHINIST



Building a Dive Bomber

The Axis has already learned to fear the Army Dauntless built by Douglas

A Name Well Earned

The *Dauntless* dive bomber won its laurels in the Battle of Midway, the Battle of the Coral Sea, and in the capture of the Solomons. Built primarily as a carrier-based plane, this ship has a wing-spread of only 41 ft.; but its flying and bomb-carrying performances have caused it to be adopted by both the Army and the Marine Corps as a land-based dive bomber. On the *Dauntless* diving flaps were brought to their present high degree of development

SOME NOVEL FEATURES are found in the moving assembly line used in an Oklahoma plant of the Douglas Aircraft Company on the *Dauntless* (A-24) dive bomber. This ship is the land equivalent of the Navy's carrier-based *Dauntless* which won lasting fame in sinking Jap warships during the battles of Midway and the Coral Sea. It is the first dive bomber to go into the service of the Army Air Corps.

Continuously moving assembly lines have been used on other planes and in other plants. But the set-up used here is distinguished by two innovations: (1) The mating operation is performed with the assembly in motion and (2) provision is made to change the height of the assembly carriage on the moving line in order to obtain the most convenient working levels at all stations. It was found that a great deal of time was lost by assemblers climbing up and down ladders when a compromise assembly height was used. The variation in level has corrected this condition.

The *Dauntless* design is unusual in that the entire fuselage is split along a horizontal parting line. Upper and lower halves are fabricated separately in stationary fixtures.

The upper half is made of three subassemblies, the forward fuselage section, the overturn structure and the tail assembly. Operations on these subassemblies are planned to take as much work as possible from the upper half fixtures, thus obtaining maximum production from them.

In a similar manner, the lower half of the fuselage is divided into four subassemblies, the wing center section, the center section fillets, the lower fuselage section and the lower tail section. This half of the fuselage is assembled upside down. The landing gear is installed while the assembly is in the fixture. Banks of fluorescent lights built into both sides of the fixture illuminate the under side of the inner wings.

Signal semaphors, much like those used on railroads, are mounted on these stationary fixtures. When the work on an assembly is completed, the lead man pulls a wire to display the signal thus notifying the inspector that the half fuselage is ready for him. The fixtures are also provided with brackets for electric drills and air guns which are a permanent part of the work stations.

The assembly line consists of two parts. The first, which has fourteen stations, is used to mate the two halves, perform the structural work on them, and to add fittings and conduits. The last three stations are "open" for final inspection, final clean-up and painting.

The fuselage lower half is first placed on the carriage and is supported by three brackets securely bolted to the assembly at points where it has high structural strength. The forward pair of brackets are positioned at the points where the catapult hooks would be located on the carrier-based bomber. The rear bracket is in the location of the arresting hook fitting also

used on the Navy *Dauntless*. Actually the land-based *Dauntless* does not have these fittings on the finished ship but advantage is taken of the ship's design to use these logical supporting points.

The frame of the carriage is made of heavy structural steel equipped with four wheels which roll along the floor. The yoke which connects with the tail fitting is a separate piece held to the frame by pins. Air lines and electric conduits encircle the fixture frame so that portable tools may be hooked up at any convenient position.

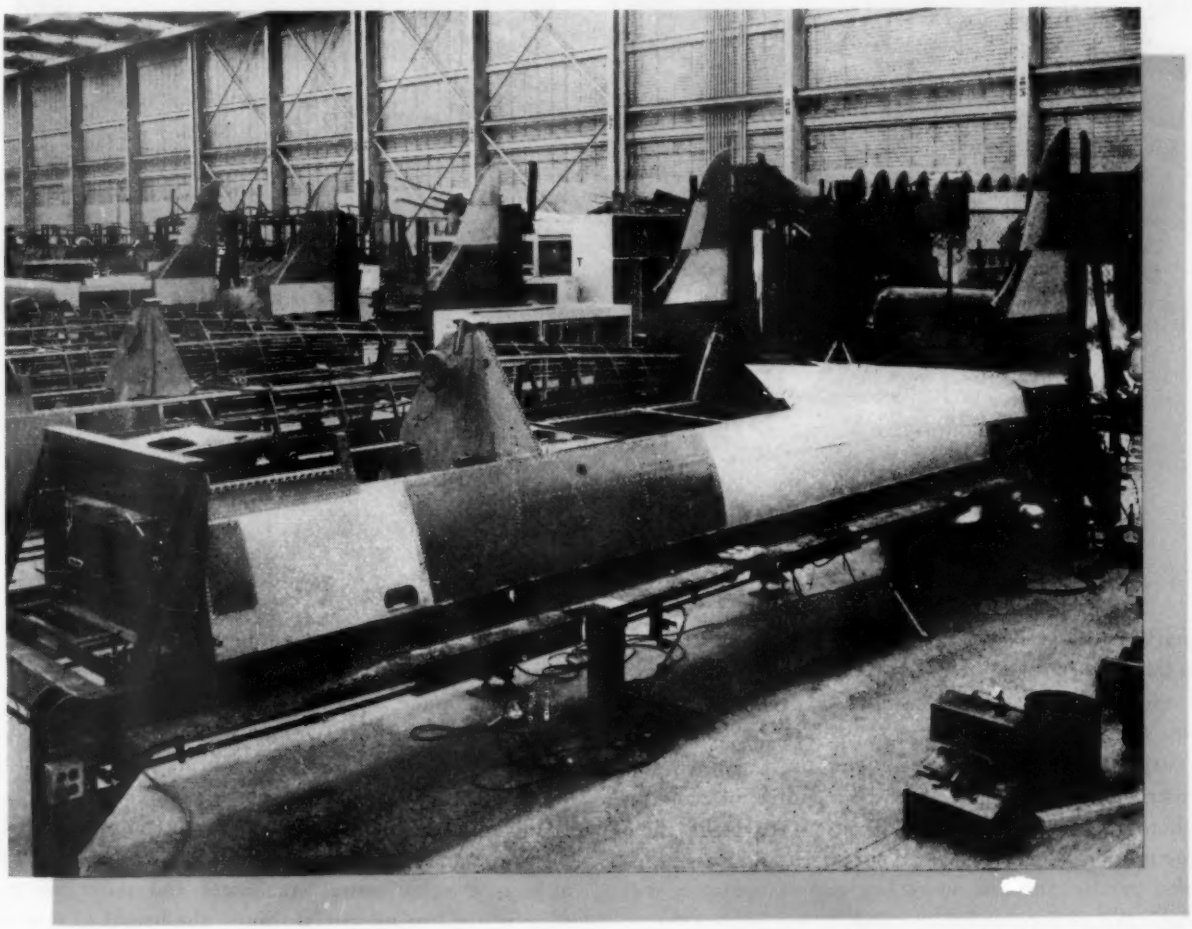
With the lower fuselage half in place, the carriage is rolled over a continuously moving chain guided by a floor channel. It is keyed to this chain forward and aft through marked links which insure uniform spacing of the carriages along the line. The chain is driven by an electric motor sunk in a floor pit at the head of the line and returns along the under side of the channel.

A pair of covered busbars parallel the line and are so arranged that a sliding contact can be plugged into the carriage by a short length of wire to provide current to all outlets. Two additional floor pits house compressed air hose reels. The hose is connected to one of the carriages which in turn is linked with other carriages by lengths of air hose. In this way two 1½-in. hose reels supply air for the rivet gun outlets on all fourteen carriages on this line.

The fuselage upper half is carried over the line by a monorail hoist and is lowered to the lower half as it moves along the line. The two parts of the fuselage are mated in motion by coordinating plates on the nose and tail. The nose plate locates the assembly from the engine mount holes, two of which are in the lower half and two in the upper half. The tail plate connects with four bolt holes in the tail wheel casting in the lower half of the fuselage and with the lower rudder attachment of the vertical stabilizer in the upper half. Since these locating points are coordinated with the two subassemblies the fuselage is correctly aligned.

Movable platforms with ladders are hooked to both sides of the assembly carriage and roll along with it. The inner wing surfaces are covered with padding so they can be used by the assemblers without being marred. On this portion of the line the bottom of the fuselage is only 2 ft. from the floor.

At the end of the first line, the carriage is unhitched from the chain and moved by hand to a similar but much larger chain. The links in this chain are also



The *Dauntless* fuselage is built in halves on stationary fixtures. This is the upper half. Note the convenient air and electric outlets; also the end plate which coordinates the engine mount holes

Fuselage halves are mated on the first of two moving lines. The lower half is mounted at three points on the roller carriage having high structural strength. Then the upper half is lowered to it by a hoist

The start of the final line shows the chain conveyor that moves the assemblies continuously. The chain returns under the floor channel

marked for carriage connecting points, but more space is left between them to allow room for empennage and engine mounting. This line is 1200 ft. long and has 48 work stations. All operations are scheduled for every station. Floor stands along the line give full instructions as to the parts to be installed and contain photographic production illustrations to make these instructions doubly clear. Tool racks and parts bins also parallel the line so each group of operators will have everything needed at hand.

The first part of the line is used to assemble all installations permanently secured to the plane. Cables are run but not rigged. In the second part of the line, controls are connected, checked and the final installations are made.

The number of stations used insures that the workers are never crowded. At no time is it necessary to have more than one assembler in each cockpit.

This line also moves continuously and is served with air and electricity. The larger subassemblies such as the horizontal stabilizers and outer wings come to the line on special stands, the height of which is coordinated with the height of the connecting points on the fuselage. The outer wing stand is ad-

justable for height, dihedral angle and angle of incidence.

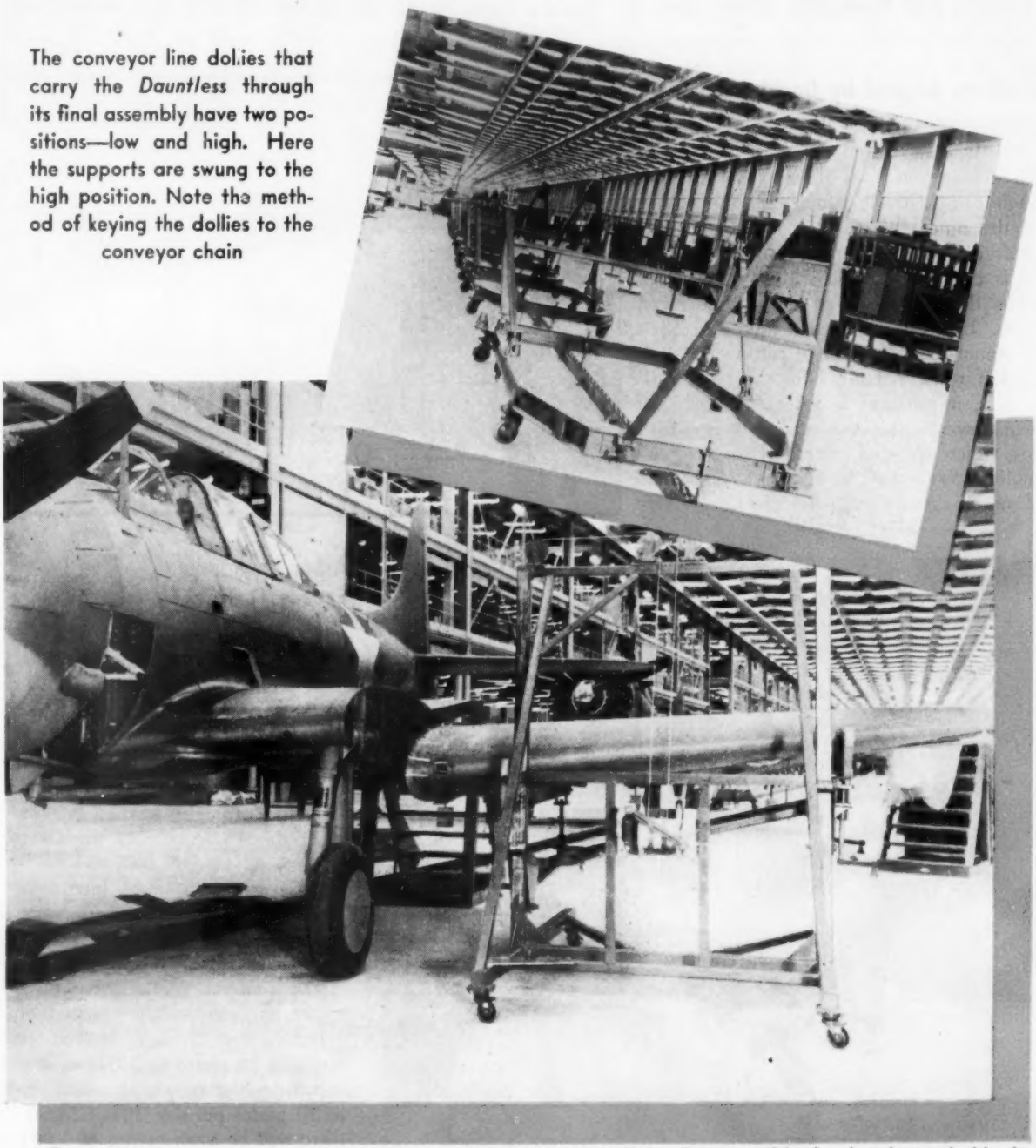
In this line, the height of the assembly carriage is changed. For 35 stations it is kept in the low position, but for the last thirteen, it is raised about 4 ft. The engine is mounted near the last station before the carriage is raised. Then the assembly is lifted by a traveling crane while the holding pins are removed and extension arms pivoted to the carriage frame are swung upward to connect with the same supporting brackets. The tail yoke is replaced by a longer one to match the increase in height. High working platforms are attached to the carriage at this point.

This change is made while the line is moving. The new high position facilitates operations on the under side of the assembly. For example, 86 bolts under the wing center section can be inserted and tightened. Also the landing gear operation can be inspected and the propeller installed.

Flexibility in the line is provided by a number of "hospital" stations where adjustments or corrections may be made. The third from the last station on the line is reserved for government inspection. The next station following is to remove "squawks."

The last station is for final check-up before the finished *Dauntless* is given its flight test.

The conveyor line dollies that carry the *Dauntless* through its final assembly have two positions—low and high. Here the supports are swung to the high position. Note the method of keying the dollies to the conveyor chain



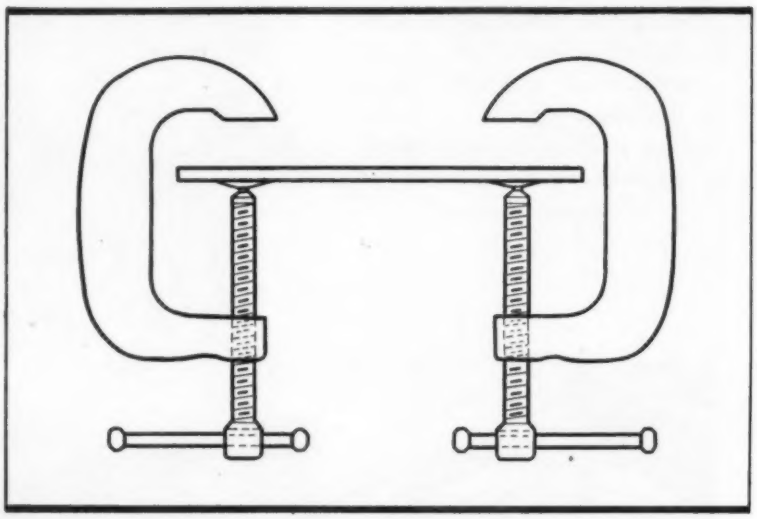
Outer wings are carried to the line on special stands that adjust the assembly for height and dihedral angle. Connections to the inner wings are easily made

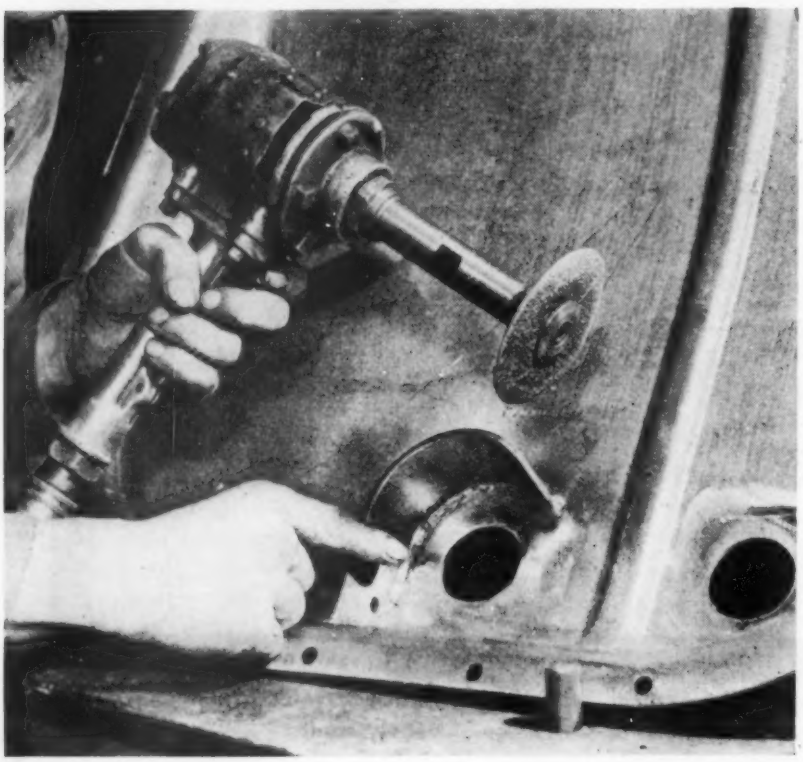
War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

Plane Parts Aligned by Double C-Clamp

An adjustable plate for locating airplane wing ribs flush with the rear beam capstrip is shown in the drawing. It is a double C-clamp, and although comparatively simple, its use has reduced the time required to position the wing ribs before riveting them to the capstrips. The clamp is expected to save at least 1,500 man-hours on the present lot of aircraft under construction. In addition to the time saved, the clamp eliminates the chance of cutting the sheet-metal skin while riveting it to the rib. At the same time, it produces a better fit than is obtainable through the use of small individual clamps, which are used commonly to align sub-assemblies. *Suggested by William F. Rudolph, Airplane Division, Curtiss-Wright Corporation.*





Arbor for Sander Speeds Surface Cleaning

The surface around two holes in the sheet-metal oil sump on the M-4 tank power train must be clean and smooth as other parts are subsequently soldered to it. A shield around one of the holes prevented the use of a conventional disk sander and cleaning had to be done by hand; therefore, an arbor 5 in. long was made for the spindle of the air motor, and a 4 in. sanding disk was screwed to the arbor. This eliminates interference between the shield and the air motor, and permits rapid and thorough cleaning of the surface up to the fillet on the shield.

The adoption of the arbor to the air motor has increased production on this operation over the hand method from 20 pieces to 36 pieces each 8-hour day. Subsequent soldering was increased from 50 to 70 pieces per day. It is estimated that there will be a net saving of 1,064 man-hours per year. *Suggested by Milford Heffren, Caterpillar Tractor Company.*

Air Guns Form Flanges on Aircraft Parts

An air gun, bolted to a bracket above a vise, is used to form flanges and radii on circumferential stiffeners for aircraft fuselage bulkheads. The gun is held above a form block clamped in the vise. Parts to be shaped are pushed along the form block under the air gun, thus forming the part to the block. The set-up has eliminated much hand work, including the clamping, backing up, and blocking of the parts to be shaped, as well as manually handling the air gun.

Production has increased on some parts from 100 to 500 pieces an hour. The set-up has been adapted to forming many other aircraft parts, including stiffener landing gear beams and circumferentials, and segments of the outboard nacelle. It is estimated that this set-up for shaping parts is eight times faster than the method previously used which required holding the part and the air gun by hand. An average of four parts a minute can now be formed, compared to one part every 2 min. by hand. *Suggested by Mitchell A. Skaff, Northrop Aircraft Incorporated.*

Shafts Heated in Water Before Straightening

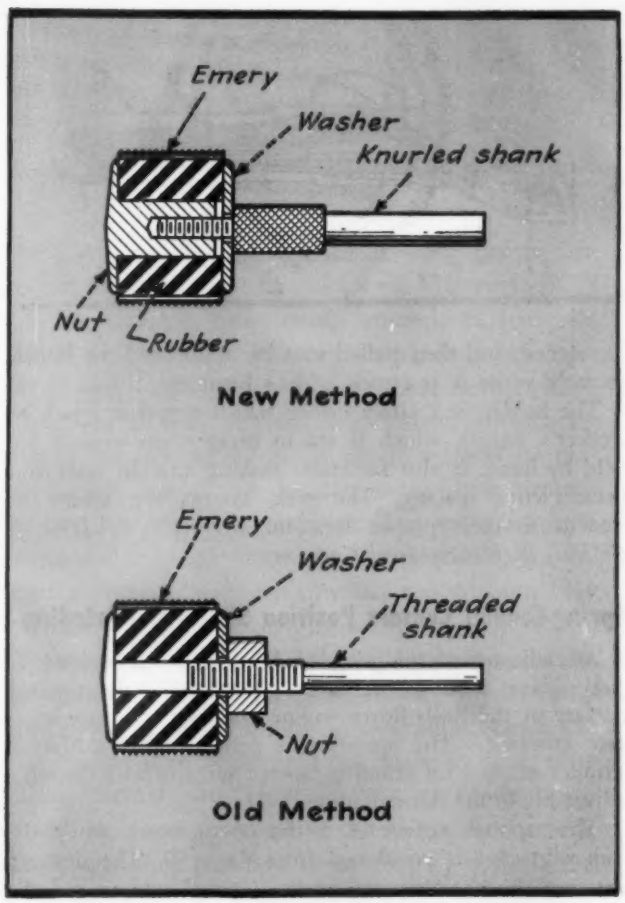
Transmission countershafts forged in one department and straightened in another prior to machining cooled off considerably before reaching the straightening press. As a result, excessive breakage occurred during the straightening operation. Such breakage was reduced to a negligible amount and straightening time and labor costs were reduced by heating the shafts in the straightening department to 180-190 F., using hot water as the heating medium.

This practice effected a saving of 400 man-hours per year, and eliminated about $1,200 annual material loss. In addition, trucking and handling of the shafts have been reduced considerably. *Suggested by Roy Camus, International Harvester Company.*

Stops Replacement of Grinder Arbors

The Type 44 arbor used with Dumore Handy grinders have to be discarded when the threads become stripped. Furthermore, a wrench is required to tighten the jam nut behind the washer when applying a new emery band. The original arbor has been replaced by one which has an enlarged knurled diameter adjacent to a shoulder that seats against the washer; thus, the operator can remove and tighten the sand drum with his fingers. The arbor will last indefinitely because the only part that wears out is the screw, which can be readily replaced. It is also unnecessary to change arbors from chamfering teeth to a polishing operation.

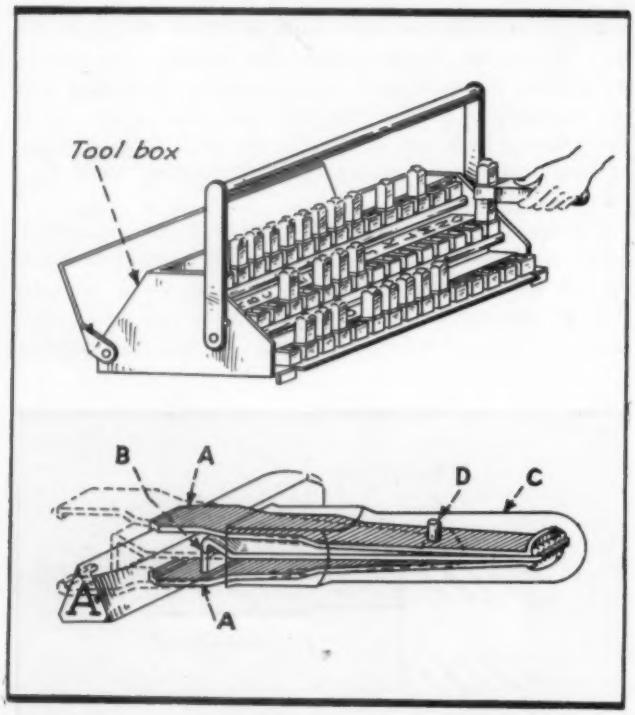
The speed with which emery bands can now be applied saves production time. In addition, it is estimated that critical war material valued at $876 is saved annually through non-replacement of arbors. *Suggested by Bernard Gedroic, Foote Brothers Gear and Machine Corporation.*



Cuts Time in Finding and Using Stencils

Since much time was lost in finding correct stencils, the illustrated rack was built with specific spaces provided and marked for each stencil. Space behind the hinged door at the rear of the rack is used to store the stencil holder, hammers, scribers and other tools.

The holder has two spring arms *A* and a stop *B*. The stencil fits between the stop and the crimped ends of the arms, which are welded together. This assembly slides in bar *C*, its movement being controlled by stop pin *D*. The arms can be extended as shown by the dashed line to grasp



the stencil, and then pulled into bar *C* to hold the stencil securely while it is struck with a hammer.

The holder is a safety device which prevents injury to worker's fingers, which is apt to occur when stencils are held by hand. It also facilitates making straight lines and better letter spacing. The rack assures the return of stencils to their proper location. *Suggested by John J. Collins, Bethlehem Steel Company.*

Spring-Loaded Centers Position Shafts for Grinding

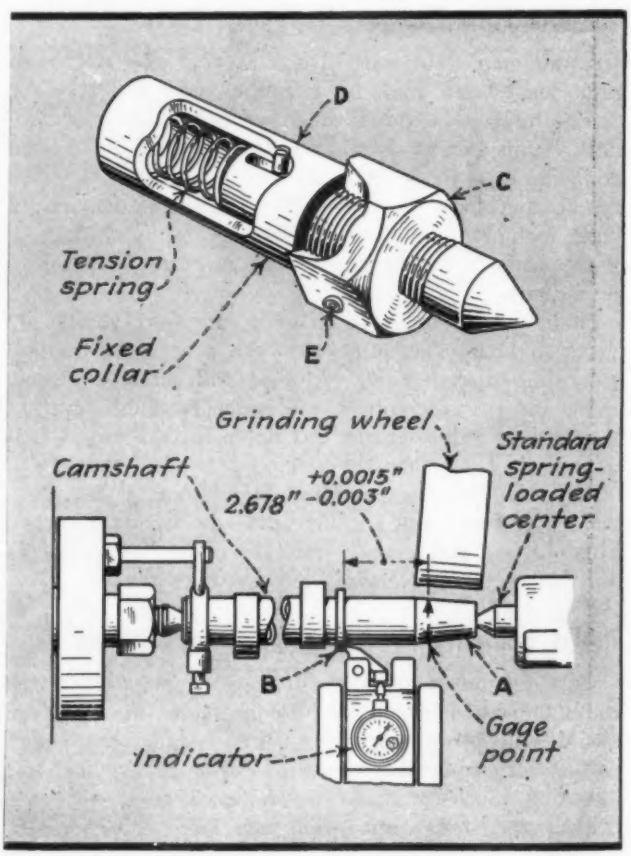
An adjustable spring-loaded headstock center used in conjunction with an indicator gage locates the tapered surface of the Rolls-Royce engine camshaft to assure accurate grinding. The operation is performed on a Norton grinder adapted for grinding tapered surfaces with the table adjustable to the desired angle.

The tapered surface *A* is the one ground, while the indicator gage is positioned from flange *B*. The distance between the gaging point on the tapered surface and the face of flange *B* is held to limits of plus 0.003 in. and minus 0.0015 in. because with a 2 in. per ft. taper, a 0.0002 in. movement laterally results in a 0.0003 in. diametral difference at the gaging point. These limits are maintained with the illustrated spring-loaded centers, using a dial indicator to check their position.

The headstock contains an adjustable spring-loaded center which, together with a standard spring-loaded tailstock center, permits lateral movement of the camshaft. The spring in the tailstock is considerably stronger than the one in the headstock, causing nut *C* to maintain constant contact with fixed collar *D* which acts as a guide for the movable inner center. Lateral adjustment of the camshaft is made by turning nut *C* and locking it in place with setscrew *E* when properly positioned.

The first shaft is ground and repeatedly checked until the distance between the flange and the gaging point is exact. The dial indicator, which is attached to a tool base, is then moved into place with the point in contact with flange *B*, and is adjusted until a zero reading is obtained.

After the first shaft is ground accurately and the dial gage set, other shafts are ground in minimum time, using the gage setting to maintain the required limits between the gaging point and flange *B*. The set-up has eliminated the difficulty in holding limits on the ground tapered portion of the camshaft. *Suggested by Woodrow Carps and Herbert Nelson, Aircraft Engine Division, Packard Motor Car Company.*



How to Run a GRINDING MACHINE

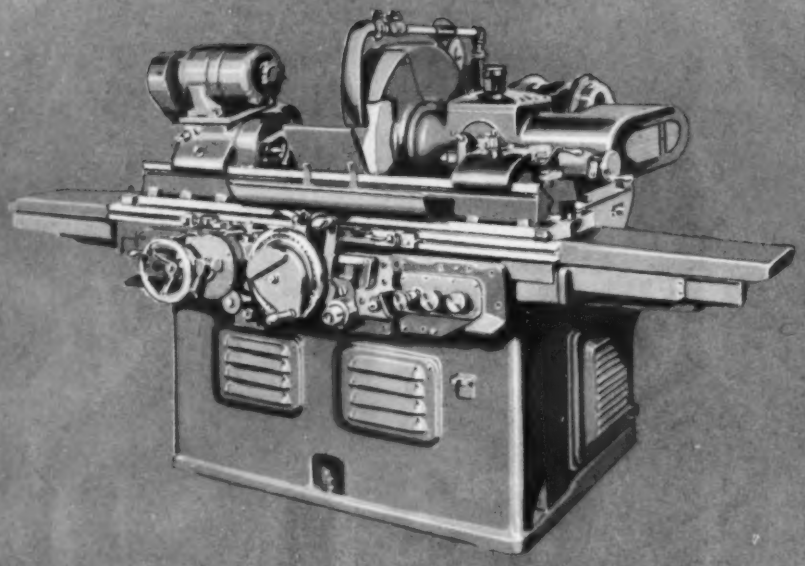
An automatic grinder can be run by a button pusher. But no shop manager is going to be satisfied with that sort of personnel. And no ambitious worker will want that sort of job forever. To start new employees on the path to full journeymanship in the field of grinding, the fifth in the "Tools of Our Trade" series presents a summary of the facts about the process, the machines and the tools. Reprints of this article are available from the Editor, AMERICAN MACHINIST, 330 West 42nd Street, New York 18, N. Y., at 10 cents a copy (less in lots of over 500).

GRINDING is the Cinderella of machine shop processes. For centuries, it existed only in the old-fashioned grindstone—a sort of backyard drudge. But during the past fifty years, it has developed into a rapid, highly efficient and precise method of producing fine machine surfaces.

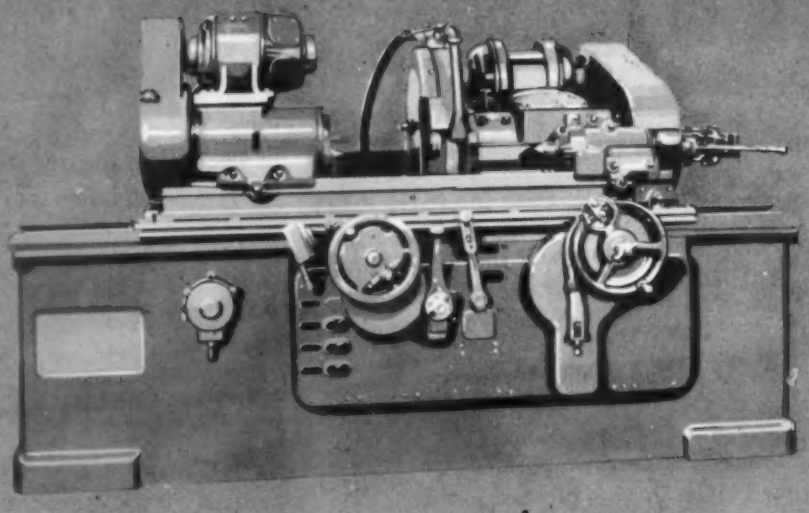
In its chief job—the finishing of parts that have been previously machined—it produces some of the truest and smoothest surfaces that can be generated in production. It works to very fine limits of dimensions. Where 0.001 in. is a close dimension in turning, milling, or boring, grinders (and precision boring machines too) are regularly manufactured which will hold down to a tolerance of 0.00005 in. Though the old grindstone was a slow, crude tool, modern abrasives will cut at a very high rate. High-speed cutting-off wheels will slice through 1¼-in. bar of manganese steel in 5 seconds. They will cut hard materials that cannot be cut in any other way and cut them with smoother surfaces and less waste.

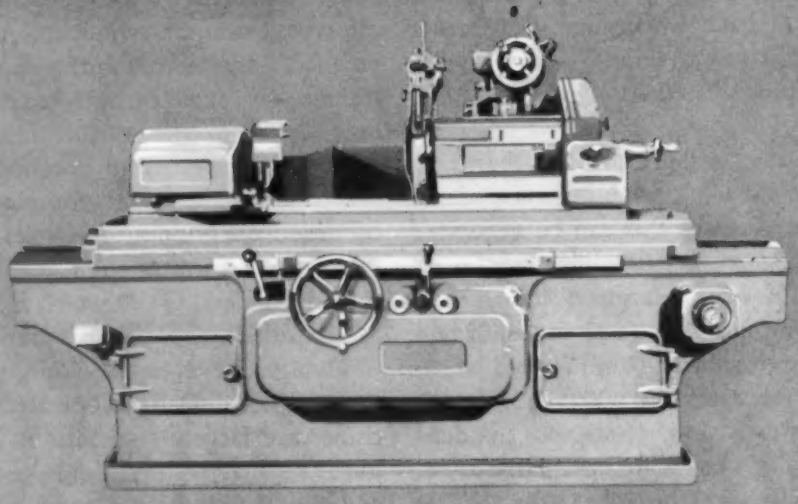
Almost every shape and size of work can be finished in modern grinding machines. Flat surfaces of all types, straight cylindrical, tapered, or irregular external and internal surfaces, cams, ball bearings, threads, gears and many other machine elements can be finished to size, shape and desired surface by grinders. In specialized instances, parts may be machined from the rough forging to a finish ground condition on grinding machines. The most accurate threads are formed from the cylindrical piece by thread grinders. Gears which must run without play are hardened, then finish ground to fine tolerances.

Though the work done on grinders is so accurate, they are not difficult to operate. In fact, modern machines are largely automatic in operation. Once the job is set up, it is often only necessary to feed, start and stop the machine. However, the intelligent operator will strive to know all he can about his machine and the grinding process. These pages are designed to get you started in acquiring this knowledge.



TYPICAL CYLINDRICAL GRINDERS

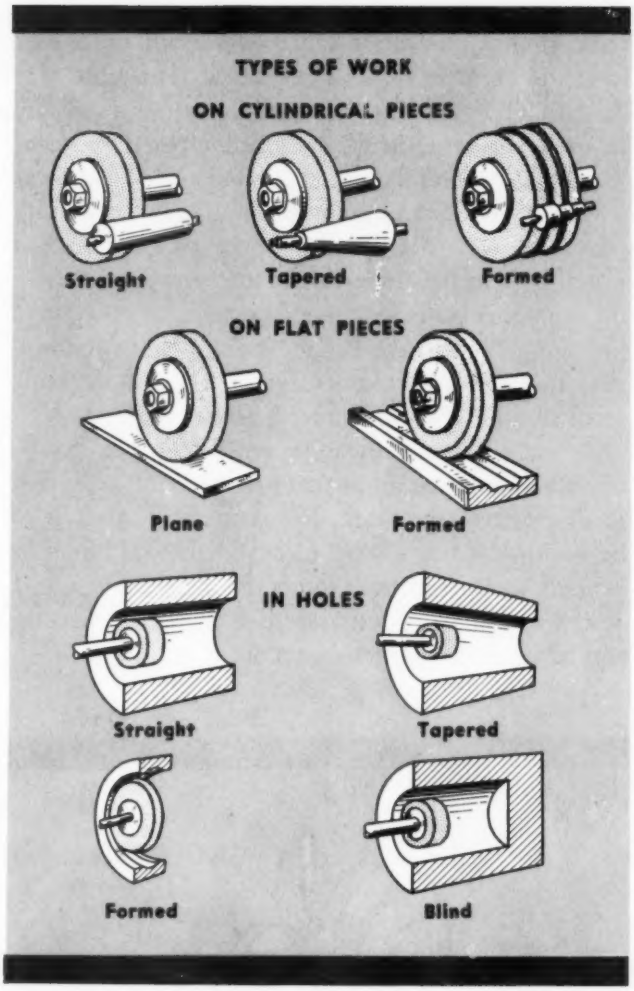




UNIVERSAL GRINDER

The grinding machine is not generally applicable a machine tool as, for example, the lathe or milling machine. The process is versatile but individual machines are not. Grinders are made in specific types for certain classes and sizes of work. The three main types of production grinders are cylindrical, internal and surface machines. This pamphlet will deal chiefly with these three types. The tool and cutter grinder is a necessity in every toolroom but its operation is more detailed and would need lengthy and specific treatment. Thread, gear, cam and other special grinders are not dealt with here.

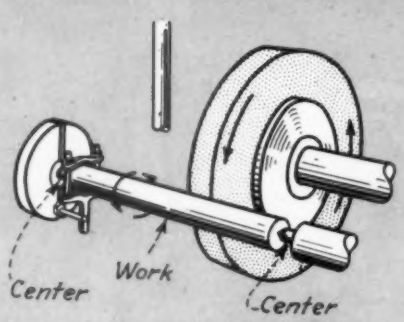
Cylindrical grinders, as the name implies, are used for most external grinding on cylindrical parts. They are used to grind straight cylinders, cylinders having more than one diameter, tapered parts. Workpieces having an irregular profile are classed as cams or eccentrics and are ground on a cam grinder.



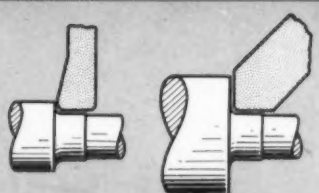
Center Type Grinding

Three distinct types of cylindrical grinders are in common use: the plain cylindrical, universal and centerless machines. In the first two, the work is usually held between centers; the third works on a different principle which will be explained later. In the plain machine, the grinding wheel is mounted on a cross-slide perpendicular to the ways. It is fed to or from the work either by hand or automatically and sometimes can be fed across the work. The universal machine, on the other hand, has a wheelhead which can be swiveled at an angle to the ways and which can usually be adapted to do internal as well as external grinding. The universal can thus perform a wider variety of jobs with a limited selection of wheels, but the plain machine has a wider range of sizes and a greater capacity. The plain cylindrical grinder is the high-production tool.

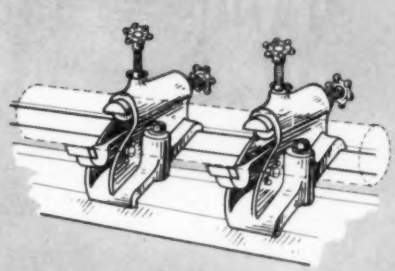
Though some jobs must be held on a faceplate, in a chuck, or in a special fixture, most work to be ground cylindrically is held between centers. Wherever possible two dead centers are used. Live centers are used when the work is such that it would score



CENTER TYPE GRINDING


TWO METHODS OF GRINDING SHOULDERS

WORK CENTER AND CENTER HOLE


STEADYRESTS

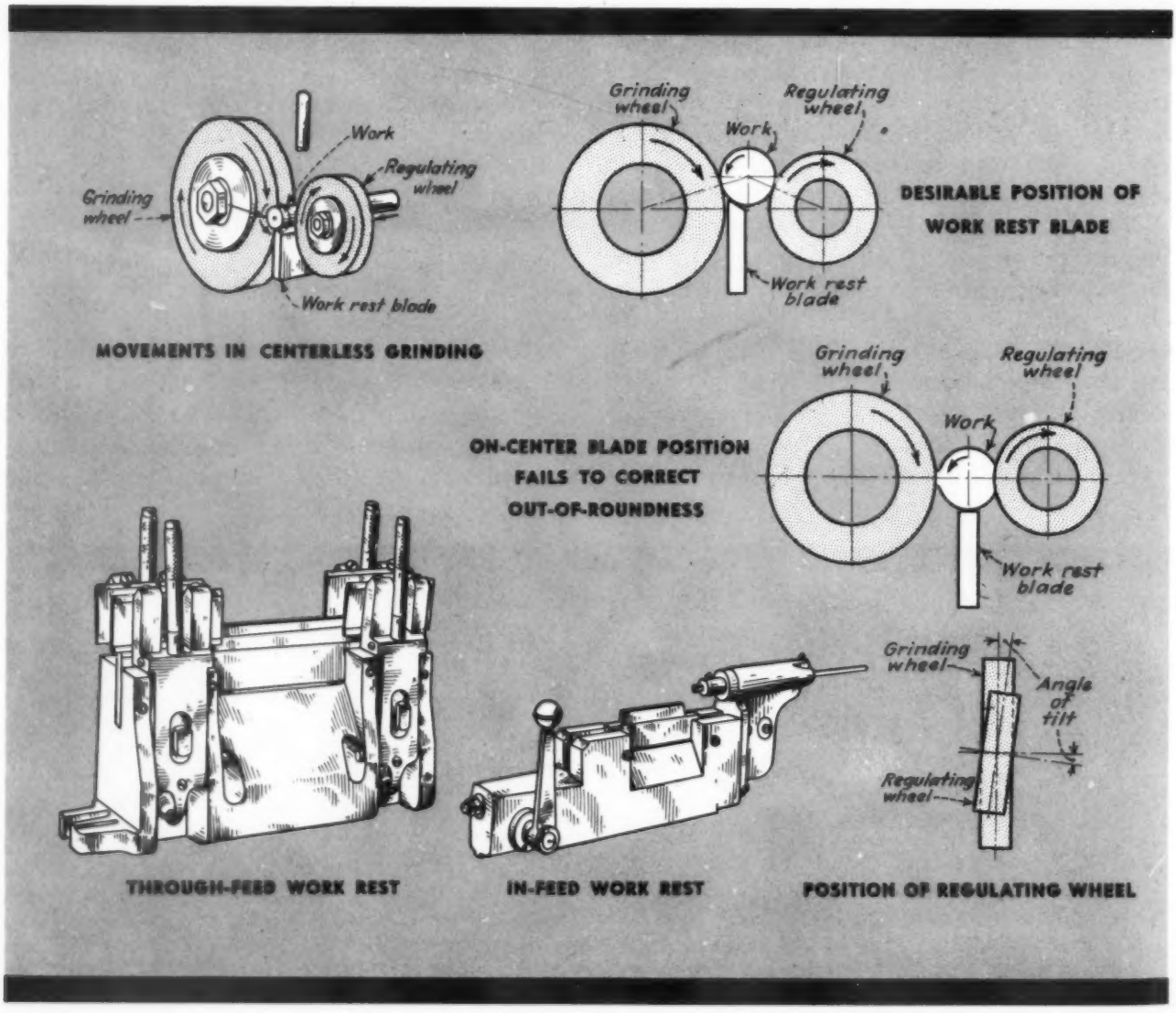
either center. Centers are held in a headstock and tailstock mounted on a table which can be moved back and forth in front of the wheel. The table may be parallel to the ways for straight grinding or may be swiveled at an angle to grind tapered sections. The work drive motor is incorporated in the headstock.

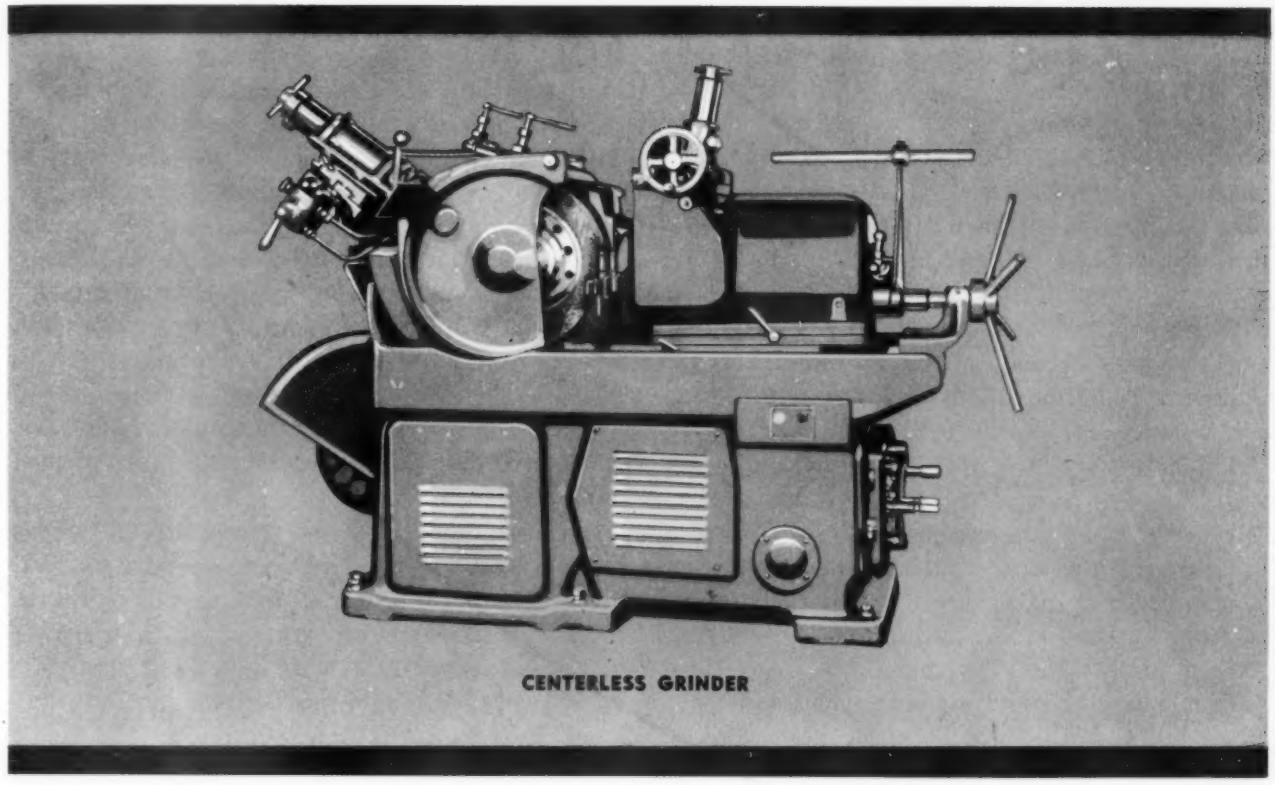
Centers alone are insufficient in many cases to support the work against the heavy pressure of the grinding wheel. Where this is true, steadyrests, having shoes to oppose the outward and downward pressure of the wheel, are mounted at suitable intervals along the work. They should be spaced evenly from six to ten work diameters apart.

As the grinding operation progresses, the steady rest shoes must be adjusted to take up the reduction in diameter of the work. If considerable stock is to be removed from a long piece, small areas may be ground almost to size at the points where the steadyrests will bear. The rests can then be set and not disturbed until the finishing cuts are taken.

The grinding wheel speed is usually maintained at about 6,500 surface feet per minute; that is, 6,500 feet of wheel surface pass any point in one minute. As the wheel wears, its speed is reduced (perhaps averaging 6,000 ft. per min.) until it is desirable to change the driving sheave to bring the wheel back to its proper peripheral speed. Work speed is adjusted until the best performance is obtained. It will usually vary from 60 to 100 surface feet per minute. For roughing cuts, the work speed is usually the same or even higher.

Before the job is run, the table stops are set to limit the table travel. For a straight shaft these would be set so that the leading edge of the wheel runs off the end about one-third its width. For roughing, the table speed is set for an advance of slightly less than the width of the wheel for each revolution of the work. For finishing, the table speed should be reduced to $\frac{1}{8}$ to $\frac{1}{2}$ in. per revolution, depending on the quality of finish desired.





CENTERLESS GRINDER

Surfaces less than the width of the wheel, formed surfaces, shoulders and similar forms are ground with no table traverse or at the most a slight oscillating motion. This is called "plunge-cut" grinding. By the use of combinations of wheels or formed wheels, as well as single straight wheels, a great variety of jobs can be ground by this method.

Centerless Grinding

A great variety of workpieces can be ground in the centerless grinder. In this type of machine, the work rests on a metal blade between two abrasive wheels. One wheel, a standard grinding wheel, grinds the chips from the work, while the other, the regulating wheel, is mounted at a slight angle to feed the work across the grinding wheel and to give the work the required rotation.

The work rest blade may be made of high-speed steel, Meehanite, grey cast iron, or, most commonly, of carbide-tipped steel. On small machines, its maximum thickness is $\frac{1}{2}$ in.; on larger ones, $\frac{3}{4}$ in. The work supporting surface is usually ground at an angle 30 degrees to the horizontal. Lower values than this are sometimes used to reduce the pressure on the blade and workpiece, for instance on thin-wall tubing. Higher values are sometimes used to secure faster rounding up action.

In most cases the work is supported by the blade so that its center is above the centerline of the two wheels. If it were exactly on center there is no correction for out-of-roundness. When it is mounted high, the points of contact are not diametrically opposite each other so that high spots on the work are ground off. Within practical limits, the higher the work is mounted, the quicker roundness is secured. The limit of height is reached when the work begins to vibrate. Soft grinding wheels permit grinding higher above center than do hard wheels.

The grinding wheel used is selected by the same rules that govern all grinding wheels. In case of doubt, however, the softer of two wheels should be chosen for centerless work. The wheel turns at about 6500 surface feet per minute. The regulating wheel is made similarly to the grinding wheel. However, except for formed work, the regulating wheel is not changed for particular jobs. It is used until worn out.

There are three general types of centerless work: through-feed, infeed and end-feed. Through-feed is used for straight pieces having no projection above the ground surface. The wheels and blade are set to give the required diameter and the pieces are passed between them with the aid of work guides. Through the use of loading chutes a high level of production can be obtained. From time to time during the operation, the grinding wheel must be advanced to compensate for wheel wear or loss in diameter.

In-feed grinding is much the same as plunge-cut grinding. It is used for work having a shoulder larger than the ground diameter. The work blade and regulating wheel are set in a fixed relation. When the work has been inserted, the regulating wheel is moved toward the grinding wheel until the proper diameter is obtained. The regulating wheel is then backed up and the piece is kicked out by a hand or automatic ejector.

Tapered pieces are ground by the end-feed method. Either or both wheels are dressed to the proper taper and the wheels and blade are set in a fixed relation. The work is fed in from the front until it hits a stop. It is then withdrawn from the machine.

To prevent long thin pieces from whipping during the operation, the work blade is sometimes set so that the center of the work will be below the wheel centerline. With this arrangement the wheels hold the work firmly against the blade.

Diamond truing tools for both wheels are built into centerless machines. Both wheels must be trued before starting a job and the grinding wheel must be dressed at times during the run. Truing the regulating wheel requires special attention since the surface must be parallel at the line of contact to the surface being ground. Thus, it must be retrued each time the angle of inclination is changed.

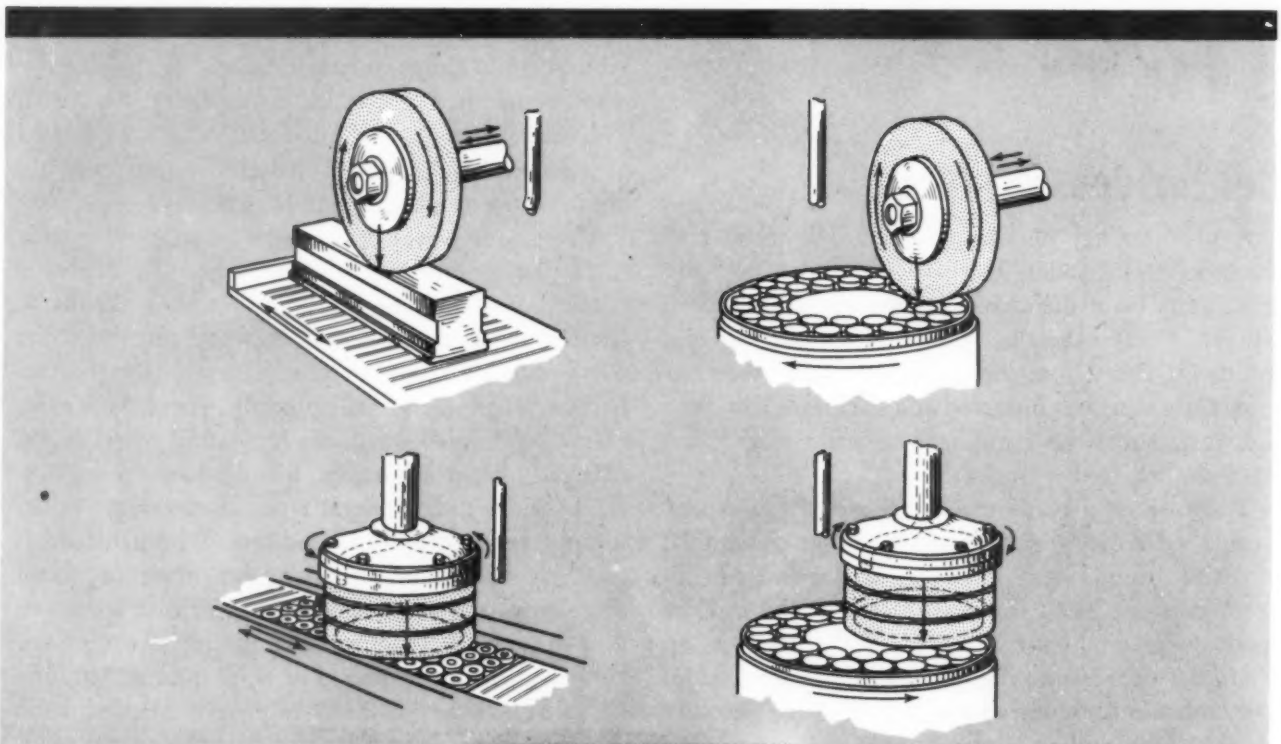
Surface Grinders

All grinding is, of course, surface grinding, but the term is usually reserved for the process of grinding a flat surface. A number of different types of machines are made for this purpose: machines having horizontal or vertical spindles, rotary or reciprocating tables, and various types of disk grinders.

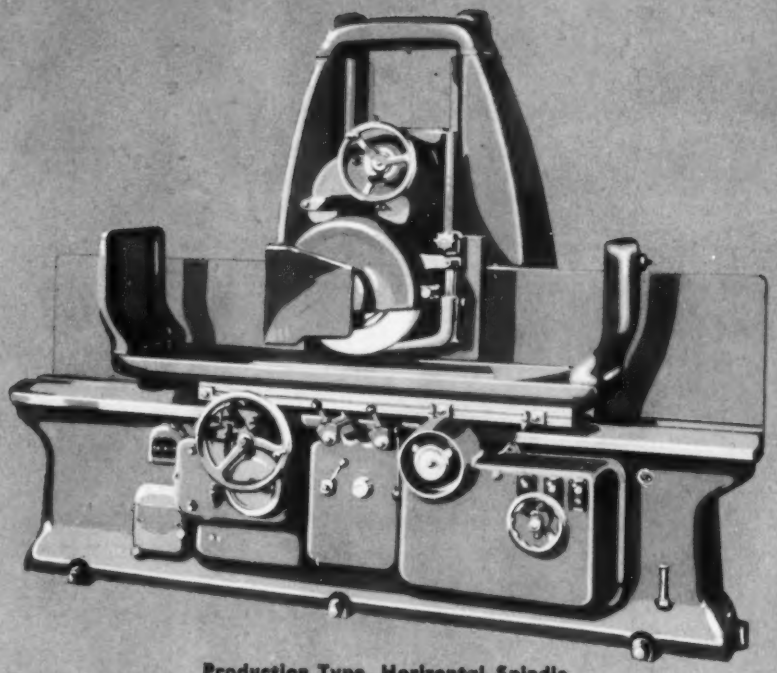
The most common type is probably that having a horizontal spindle and a reciprocating table. The wheelhead is so mounted that the wheel can be raised or lowered to accommodate various sizes of work. When the wheelhead is in place, the wheel may be fed to the work either by hand or automatically.

The table moves back and forth under the wheel. In toolroom work, hand table feeds may be used but in most production work the table travel is controlled automatically. Both the speed at which the table moves and the distance it travels can be set before the job is begun. Table speeds in this type are very rapid, up to 60 ft. per minute or more.

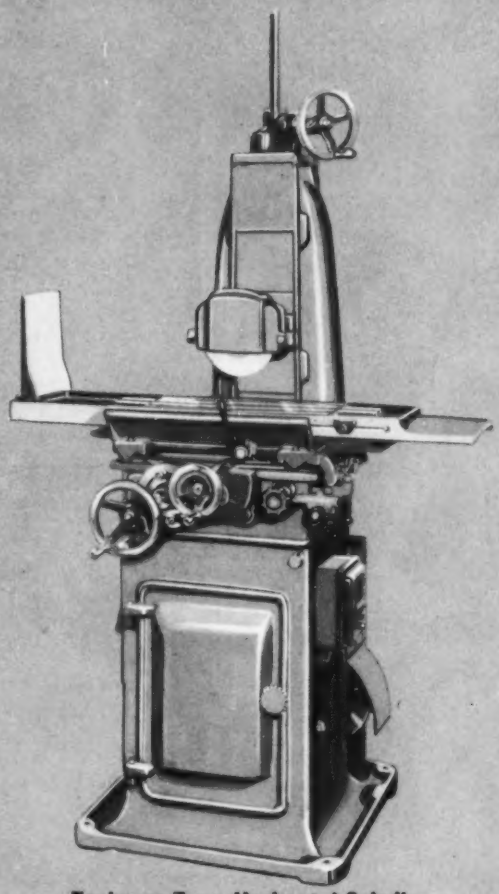
Where possible, the work is held on a magnetic chuck which is built into or attached to the machine table. For high production, a number of identical pieces may be held on the chuck at one time. After grinding, the pieces may be put through a demagnetizer. Parts which would be injured by magnetiza-



TYPES OF SURFACE GRINDING

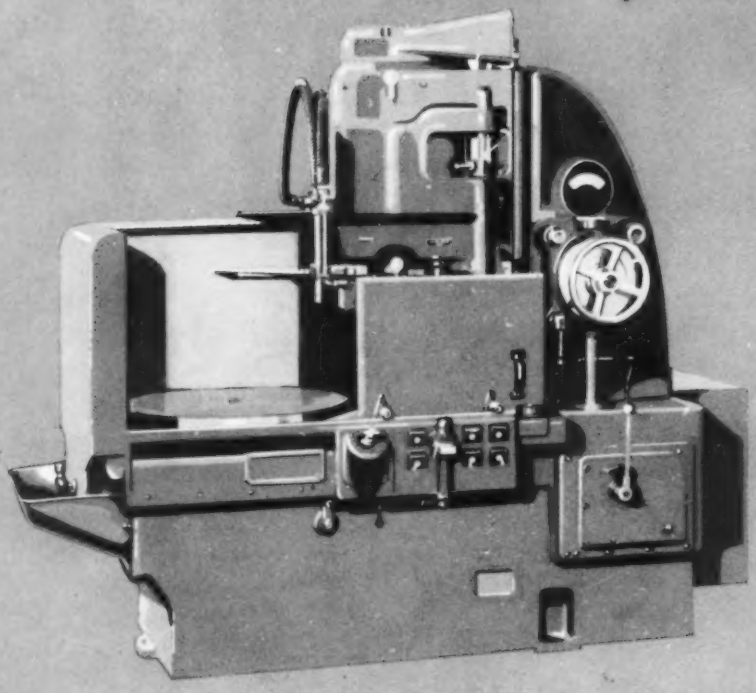


Production Type, Horizontal Spindle

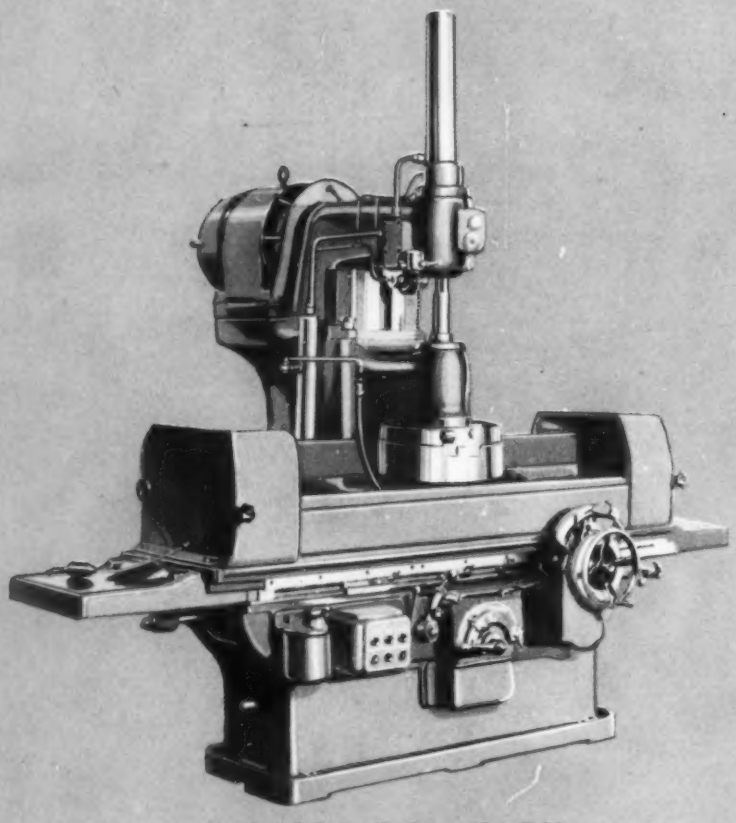


Toolroom Type, Horizontal Spindle

SURFACE GRINDERS



Vertical Spindle, Rotary Table



Vertical Spindle, Reciprocating Table

SURFACE GRINDERS

tion or which cannot be magnetized must be held by some other means. In this case clamps, vises or fixtures are used.

The wheels used in this type of machine are usually plain wheels which cut on the periphery. In grinding shoulders, a recessed wheel may be used, and in grinding V's and other shapes wheels with formed edges are used.

Another high-production surface grinder is the vertical spindle, rotary table machine. On this type, the work is carried under a segmental or cylindrical wheel by a slowly rotating or traversing table. Because the wheel cuts such a large area, only one pass under the wheel is usually required.

On the hand operated type, the table rests on a slide so that it can be moved out from under the wheel to be loaded or unloaded, then traversed back under the wheel for grinding. The wheelhead is raised or lowered to allow clearance for the table.

On automatic types the table is permanently located under the wheel. In one version, small work is loaded on a separate rotating table from which it is guided on to the grinding table. After the work passes under the wheel, other guides lead it off the table down a chute to the demagnetizer.

The table in this type is really a large rotary magnetic chuck. Steel and iron parts are held directly by magnetism. Nonmagnetic materials are either clamped or held with magnetized steel blocks. Because work may slide on the chuck surface, stops of one sort or another must be used. Small flat pieces are usually held between two steel rings. Since the pull of the magnet is strongest at the brass rings, work should be placed on the chuck so that it crosses as many rings as possible.

The wheel can be fed down to the work either by hand or automatically. For most operations, automatic feed is used. On fully automatic machines, sizing devices control the feed, advancing the wheel to take up wear as the finished pieces approach the upper limit of the allowed dimension.

Because of the wide area of contact and the rotary action of the table, the wheel tends to be self-truing. For this reason, it is general practice to use soft coarse wheels. Though soft wheels maintain a good cutting action, some dressing is required. Wheel dressers of either the diamond or mechanical type are built into the machines.

Since the work ground can only be as accurate as the table surface, the chuck should be trued occasionally. This is done by bringing the wheel down to bear on the rotating chuck until it removes about 0.001 in. This should be sufficient to give a new true surface.

Internal Grinders

Internal grinders are used to grind all sorts of internal surfaces. Straight or tapered holes, through holes or blind holes, or holes having more than one diameter may all be ground by this class of machine.

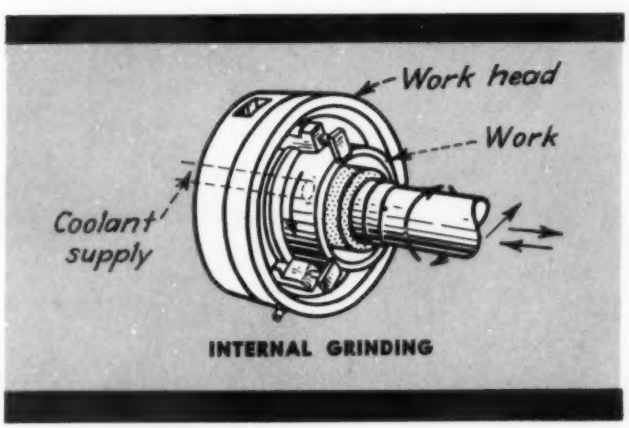
Two types of machines are in common use. One has the wheelhead mounted on a cross-slide which can be fed horizontally across the ways. Another has the wheelhead mounted on a swinging arm suspended from an overhead crossbar. In both types the wheelhead can be traversed parallel to the ways to finish the full length of the surface.

The work is held in a chuck or fixture on a separate driving head which can be mounted in line with the wheel or swiveled at an angle to grind tapers. In high production, special chuck jaws are often prepared for each job. For irregular shaped pieces, a special fixture is made in the toolroom.

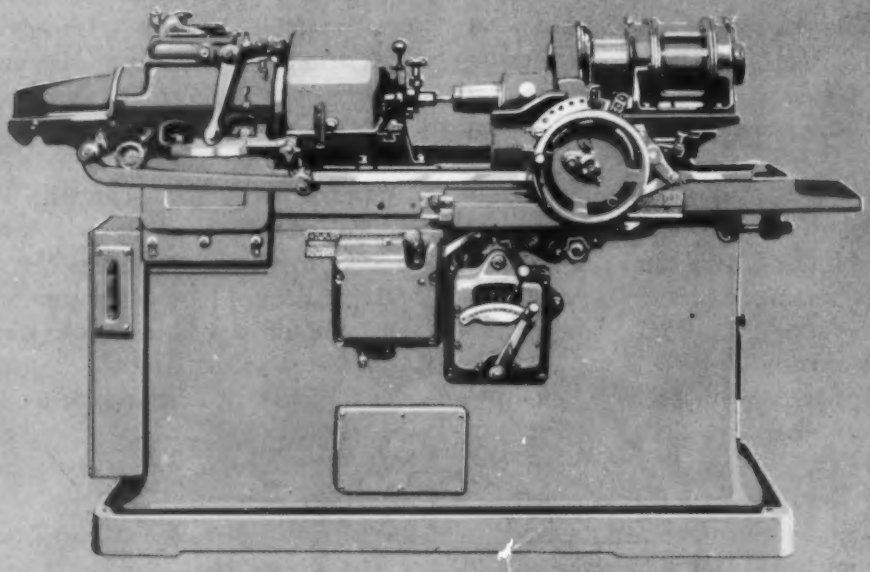
The wheels used in internal grinding are much smaller than in other types. They range from the smallest mounted points to wheels of 10 to 12 in. in diameter. The wheel is, of course, smaller than the hole to be ground. The difference is small when the hole is small. A ½-in. hole, for example, might be ground with a 7/16-in. wheel. The difference in size is more pronounced with larger holes. A 6-in hole should not be ground with a wheel much larger than 4 in.

Because of the small wheel size, the spindle of internal machines must run a very high rate in order to give the wheel its proper surface speed of 4000 to 6000 surface feet per minute. New operators sometimes find these high speeds a little frightening. There is no need for fear, however, as a properly operated machine is thoroughly safe.

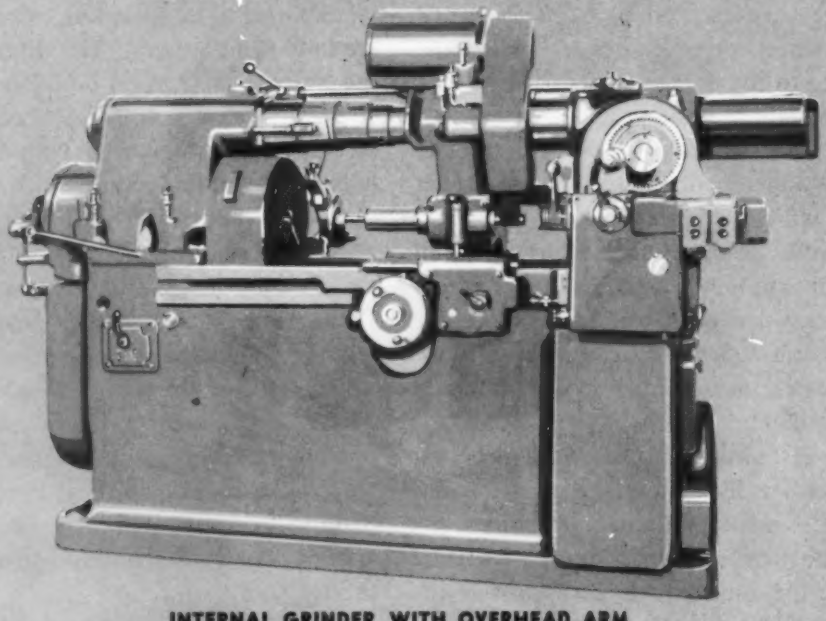
Work speeds on internal grinders are also higher than in cylindrical grinding because of the larger area of contact. A fair average would be 150 to 200 surface feet per minute.



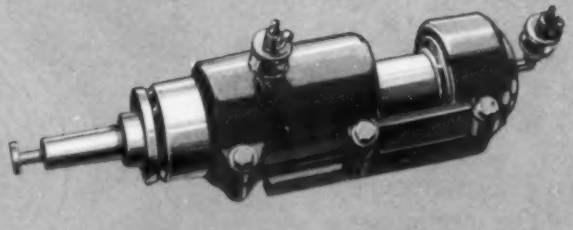
INTERNAL GRINDING



INTERNAL GRINDER WITH WHEELHEAD ON CARRIAGE



INTERNAL GRINDER WITH OVERHEAD ARM



INTERNAL GRINDING SPINDLE

Most modern internal grinders are highly automatic in operation. Little remains for the operator after the job is set up but to start and stop the machine and to load and unload the chuck or fixture. The traverse to the work, the longitudinal and cross feeds and the dressing of the wheel are all carried on without the operator's attention. A typical cycle might run as follows: the wheel is traversed rapidly up to the work; slows down to grinding speed; rough grinds the hole; is withdrawn to the automatic dressing tool which resurfaces the wheel for the finish cut; finish grinds the hole; and withdraws to the starting position and stops.

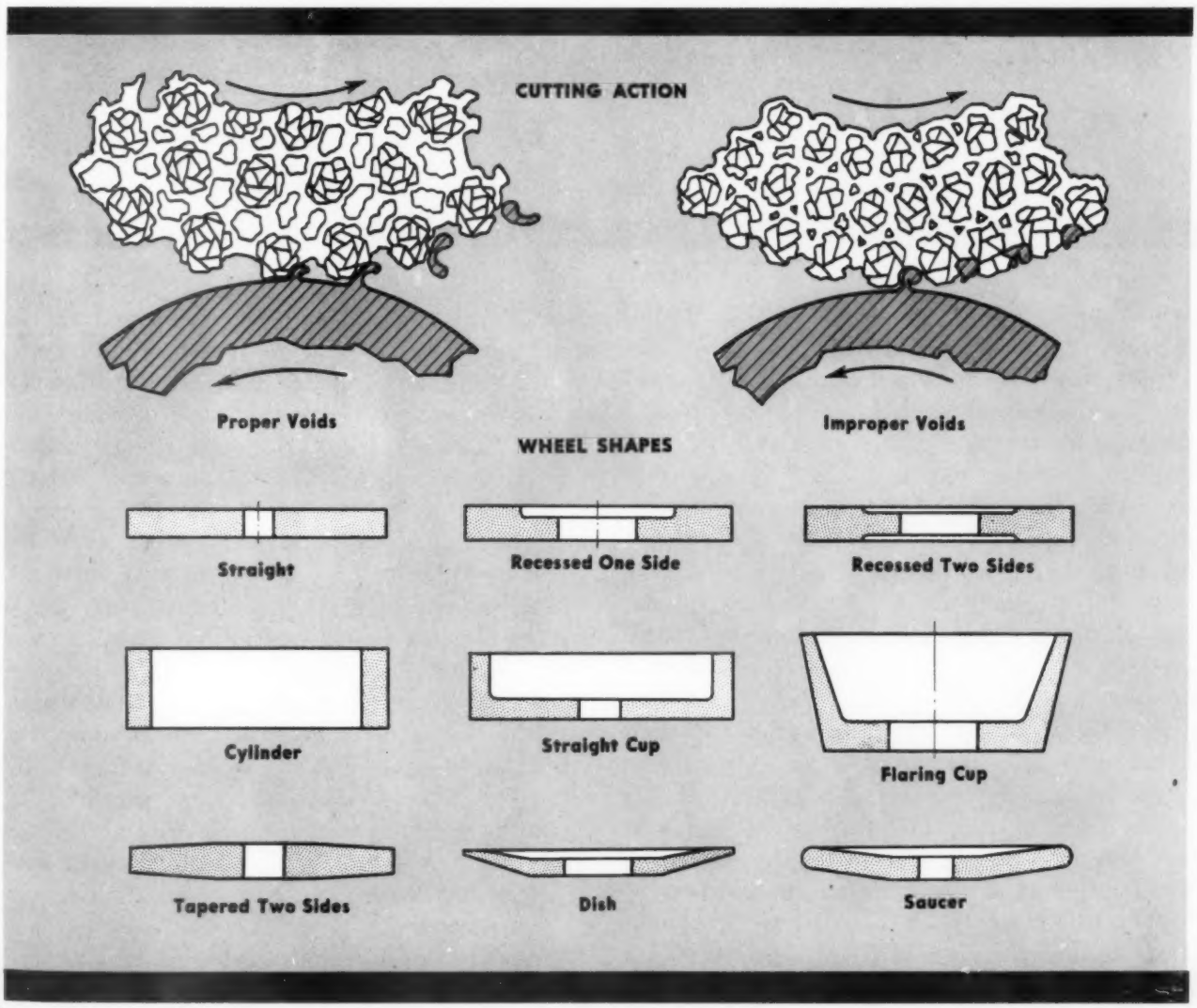
Grinding Wheels

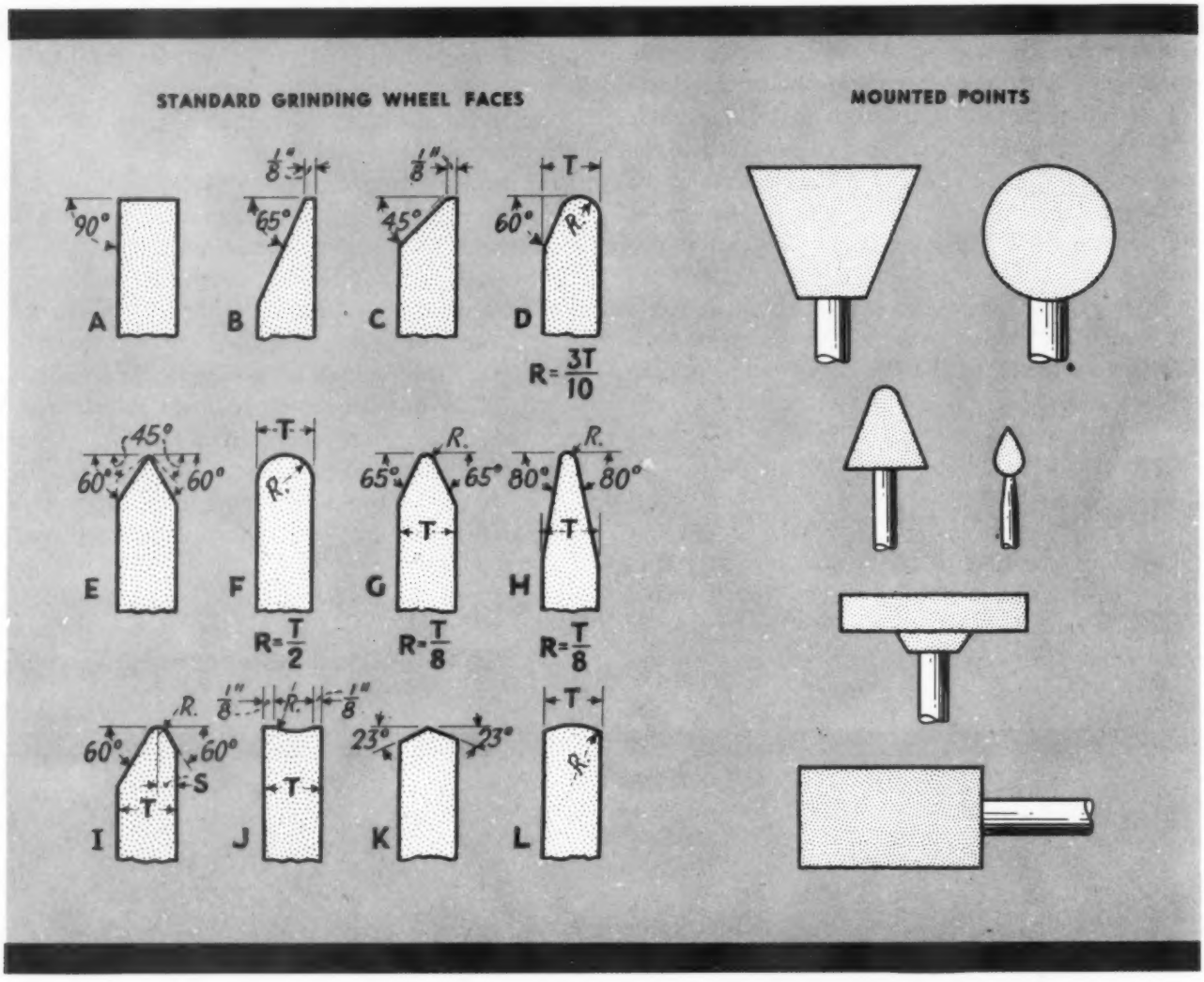
Grinding wheels are made of small, sharp crystals of very hard material held together by strong, porous bonds. As each grain whirls past the work, it cuts a small chip. The accumulated effect of many grains gives the work its smooth, straight surface. As each grain becomes dull, it is torn from the bond and fresh crystals are presented to the work.

Five important factors determine the nature of a particular wheel: the kind of abrasive, grain size, grade, bond and structure.

Modern grinding wheels are formed of two kinds of material, silicon carbide and aluminum oxide. Silicon carbide has harder and sharper crystals, but aluminum oxide is very hard and tough. It does not break down so readily when used on high-strength materials. Silicon carbide is preferred for grinding materials low in tensile strength, such as cast iron, brass, aluminum, hard rubber and building stone. Aluminum oxide is better used on most steels, malleable iron and tough bronzes. Most manufacturers make a few variants of each type of abrasive to meet special job conditions.

The size of the abrasive grains in modern wheels varies widely but is carefully graded. They vary from grains that will pass through a screen having eight





meshes to a linear inch but not through one having ten meshes to grains that will pass through a 240-mesh screen. Even finer "flour" sizes are made. In general, coarse grains are used for rapid stock removal, fine grains for fine finish; coarse wheels for soft ductile materials, fine wheels for hard brittle work. Many jobs, however, can be both roughed and finished with a medium grain wheel.

The grains are held in the wheel by a bonding material. There are five chief types: vitrified, silicate, resinoid, rubber and shellac. About 75 percent of all grinding wheels have a vitrified bond. They are strong and porous and are not affected by water, acid, or oils at ordinary temperatures. Silicate wheels release grains more readily and so are milder acting. They are used in making large wheels. Shellac wheels are light-duty, high-finish tools frequently used in cutlery work. Resinoid and rubber bonds are used for high-speed wheels, such as cut-off wheels.

The strength with which the grains are held by the bond is called the grade. Grade might also be described as the hardness of the wheel. It depends, usually, on the size of the bond posts between abrasive grains. The ideal grade for a job would be one in which the cutting grains break free at the exact moment when they become so dull that they no longer produce the desired surface in the desired time. However, other factors than the manufacturer's grade influence this condition so the discussion will be reserved until later.

Abrasive grains are not packed tightly in the wheel but are distributed through the bond. The relative spacing is referred to as the structure. This is an important factor in the cutting action of the wheel. The finest finishes are produced with a closely spaced structure. However, close grained wheels allow very little clearance for chips and so tend to clog easily. Moreover, close grained wheels do not release dulled grains as readily as wheels with a more open structure. Fine structures are best for brittle materials and finishing cuts; coarse structures for heavy cuts and ductile materials.

Manufacturers of grinding wheels have standardized on the nine wheel shapes and twelve wheel

faces shown in the illustration. In the wide range of sizes in which they are made, these wheels will do most grinding jobs. A great variety of what are called "mounted points" are also made. These vary in width from 3/32 in. to 1½ in. They are used for grinding small internal surfaces and removing burrs on precision parts. Large surface grinding wheels are often made up of small segments held in a special chuck. The shape of the segments is determined by the type of chuck used.

Formerly each manufacturer used his own system of indicating the nature of a grinding wheel. Recently, however, a standard system has been set up. This has been accepted by the Grinding Wheel Manufacturer's Association though wheels in stock may not yet be so marked.

The marking consists of six parts: (1) abrasive, (2) grain size, (3) grade, (4) structure, (5) bond and (6) manufacturer's record.

The abrasive is represented by a letter as follows:

A — Aluminum oxide, regular

B — Aluminum oxide, refined

AB — Mixture of regular and refined aluminum oxide

C — Silicon carbide, regular

CG — Silicon carbide, refined

D — Corundum

E — Emery

F — Garnet

The grain size is given by the number of meshes per linear inch in the grading screen. The grade is given by the letters S for soft, M for medium and H for hard for the general classes and numbers 1 to 7 for the increasing degree of hardness within the three general classes. The structure is indicated by the numbers 1 — 9, where 1 is the most dense, 5 medium and 9 the most open. The bond is given by:

V — Vitrified

S — Silicate

E — Shellac or elastic

R — Rubber

B — Resinoid (Bakelite, etc.)

O — Oxychloride

The sixth position is reserved for any private factory records of the individual manufacturer.

A typical marking might be

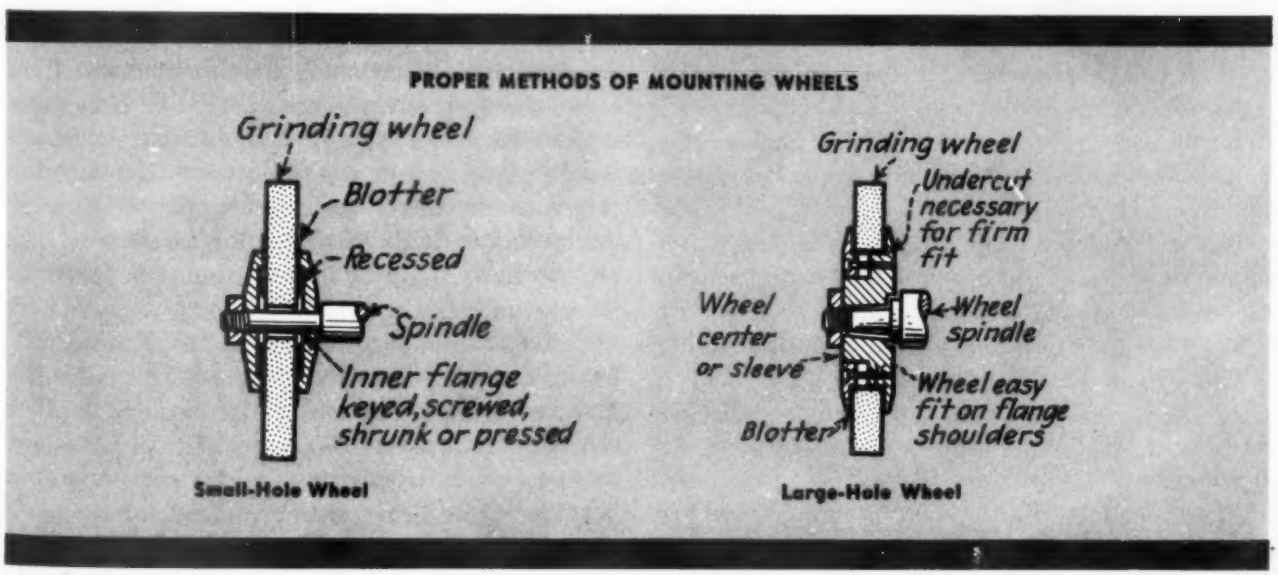
B 46 M2 5 V E

which would designate a vitrified bonded wheel of refined aluminum oxide of medium grain, grade and structure.

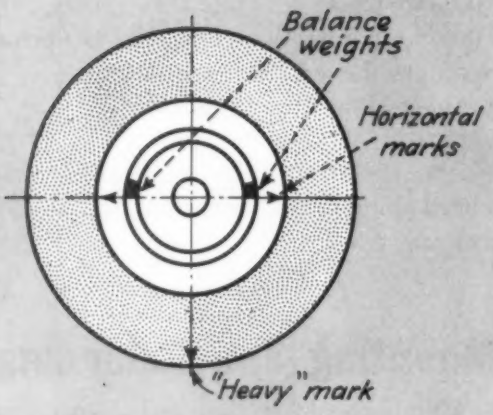
Mounting and Balancing

Wheels should be mounted on the drive spindle in the case of small-hole wheels, or on the grinding wheel center if large-hole wheels are used, with an easy, sliding fit — about 0.005 in. is the proper clearance. Ordinarily the wheel is a reasonable fit and there is no undue eccentricity in the location of the wheel on the wheel sleeve or spindle. If the fit is too tight, the hole in the wheel should be scraped. If it is too loose, paper shims may be wrapped around the the wheel center or spindle as the case may be, to center the wheel. In this way the wheel is mounted so that it is in relatively good balance and the initial truing is reduced to a minimum.

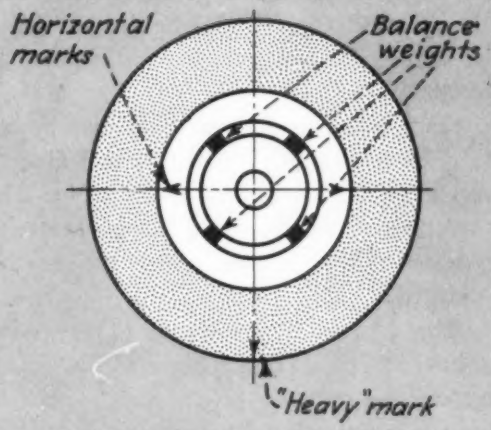
Two equal flanges of ⅓ to ½ the diameter of the wheel supply the real support. The inner flange is keyed, screwed or pressed on the spindle. The outer flange should have an easy sliding fit so that it can adjust itself slightly to give a uniform bearing on the



METHODS OF BALANCING



Two Balancing Weights



Four Balancing Weights

wheel. Both flanges should be relieved at center so that they bear evenly on the outer edges only. Washers about 0.025 in. thick are placed between the wheel and both flanges. These are usually made of blotting paper but may also be made of rubber or leather.

Small wheels are held by a single nut on the spindle end. This is tightened firmly but not excessively to prevent built-up stresses in the wheel. Large wheels are held by a series of bolts around the hub. These are all first drawn up tight with the fingers. One bolt is then tightened with a wrench. Then the bolt diametrically opposite the first bolt is tightened. A bolt halfway between the first pair is then tightened, then the bolt opposite it. This practice of tightening opposite pairs is continued until all the bolts have been brought to a firm but not excessive grip.

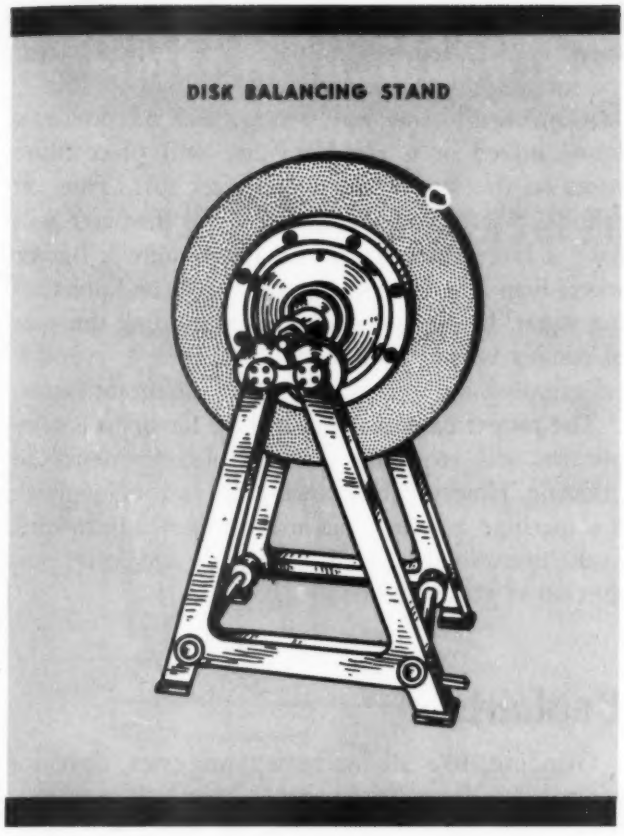
Before being placed in the machine, the wheel should be balanced. An out-of-balance wheel sets up excessive vibration, creating a serious danger of wheel breakage. It also hammers the work, marking it with a checkerboard chatter pattern.

The wheel is mounted on a balancing spindle and rested on a balancing stand. Two types of stand are in common use. One consists of a pair of parallel ways which are true and perfectly level. The other consists of two V's formed by pairs of overlapping disks. To prevent the appearance of false conditions, the balancing equipment must be in perfect shape and perfectly clean.

When the wheel is placed on the stand, it will oscillate for a moment before coming to rest. The exact bottom of the wheel is then marked with chalk. The wheel is then rotated and allowed to come to rest again. If the chalk mark is again at the bottom, the wheel is out of balance and the chalk mark indicates the heavy side.

The one-sidedness of the wheel is offset by moving balancing weights which are incorporated in the hub. Usually two or four weights are used. With two weights, one is placed on each side of the wheel just above the horizontal diameter when the heavy spot is centered at the bottom. Each is then moved upward slightly and the wheel is rotated. If it comes to rest with the heavy work down, the weights are moved higher. If the chalk mark is uppermost, they are lowered slightly. This is continued until the wheel is in balance.

Usually a grinding wheel need be balanced only before the job is run, but in some cases balancing may be required before and after truing. Greatest economy in time and wheel material is obtained when the wheel is initially located as near central as possible on the sleeve, thereby minimizing the stock removed in the first truing.



Truing and Dressing

Wheels are prepared for grinding by removing enough of the cutting face to give it the desired squareness or form. This is known as truing. When a wheel has been run for some time, it may become clogged or glazed. It is then dressed to restore the original surface or to prepare it for the finishing operation. Truing and dressing are alike in the manner in which they are done but differ in their purpose.

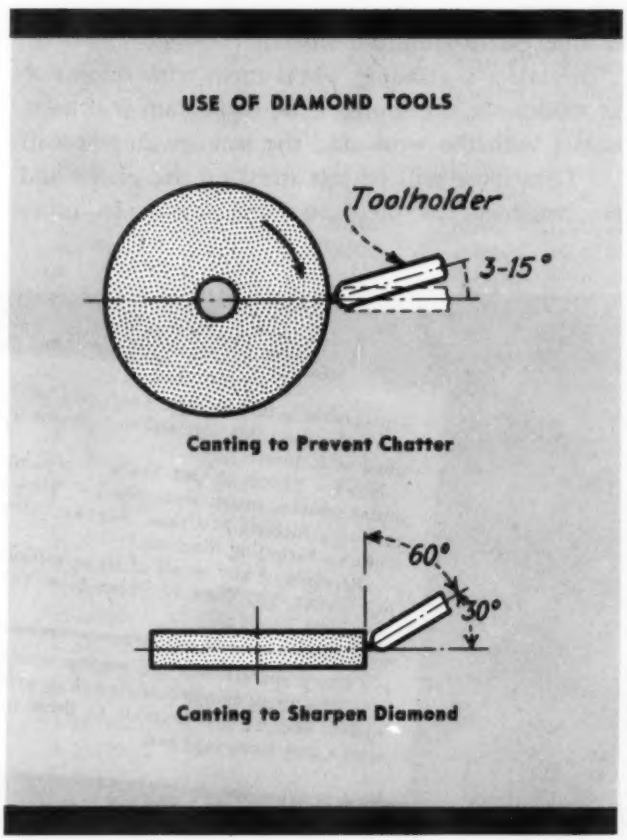
For use on precision grinding machines there are four chief types of wheel dressers: the diamond tool, abrasive stick, abrasive wheel and mechanical dresser. Of these, the diamond is perhaps the most common and useful. All types must be held in firm mounts on the machine in order to produce precise surfaces. This may be a special attachment bolted to the machine or an integral part of the machine. One popular type holds a truing tool on the tailstock. In many automatic machines, wheel dressing is made part of the automatic cycle.

Abrasive dressing wheels are mounted at a 5 to 7-deg. angle to the grinding wheel axis. They are brought into contact with the wheel with an infeed of 0.002 or 0.003 in. and traversed across the grinding face. Care must be taken not to run the dressing wheel off the face being dressed as it may gouge the face when the table travel is reversed. The dresser should not be traversed across the wheel with no infeed as either the wheel or dresser or both may be glazed.

The dressing wheel must be in good condition if the grinding face is to be dressed true. Any run-out in the dresser bearings will cause inaccuracies in the the grinding face. The face of the dressing wheel must also be trued occasionally. This can be done by canting the dresser at an angle of 10 to 15 deg. and taking a light cut across the grinding wheel.

Most precision grinding wheels require the use of a diamond truing tool. These consist of one or more industrial diamonds mounted in a nib at the end of a steel rod. The diamond is advanced to the wheel at its horizontal center line with the nib pointed down at an angle of 3 to 15 deg. If there is any doubt about the location of the center line, the nib should be lowered slightly. If it is brought to bear on the wheel above center, it may gouge the wheel. In order to make the diamond self-sharpening, the nib is also turned at a 30-deg. angle in the horizontal plane.

The diamond is advanced to the highest part of the wheel (usually at the center) and a series of cuts 0.001 in. in depth are taken until the wheel is perfectly round. This will usually leave a surface satisfactory for rough grinding. If a finer finish is required, one or two cuts of 0.0005 in. in depth are



aken and then several passes are made across the wheel with no infeed. For roughing, a traverse at medium speed is best, with a somewhat slower speed for finishing. Too rapid a traverse will leave marks on the wheel; too slow a pass will tend to glaze.

Whichever method is used, dressing or truing should be done under the same conditions as the grinding job. If the work is to be ground wet, the wheel should be dressed wet. If dry, the dressing should be done dry. When dressing dry with a diamond tool, time should be allowed for the diamond to cool after each pass.

Theory

Under ideal conditions, a grinding wheel will sharpen itself as soon as the grains become dull but not before. It will do this while removing stock as rapidly as is consistent with the desired finish. In practice, a wheel which sharpens itself automatically all the time will wear away too rapidly. A properly acting wheel will need occasional dressing.

Besides the nature of the wheel, grinding action is affected by several factors. Among them are the speed of the grinding wheel, the work speed, the area of contact between the wheel and the work, the depth of cut and the rate of traverse of the work past the wheel. All of these affect the size of the chip which is cut and the stresses which tend to tear the grains from the wheel.

The faster a grinding wheel turns with respect to the workpiece, the shorter time each grain will be in contact with the work and the smaller chip it will cut. Thus there will be less stress on the grains and less tendency for them to break away. In other words, the wheel will act hard. However, if the work speed is increased with respect to the wheel speed, the reverse will be true and the wheel will act soft.

In much the same way, a large area of contact, a heavy infeed or a rapid traverse will place more stress on the wheel and make it act soft. Thus, in cylindrical grinding, a piece of large diameter will have a large area of contact and require a harder wheel than a smaller workpiece, other conditions being equal. In internal and surface grinding the area of contact is proportionately larger than in cylindrical grinding and so is an even more important factor.

The proper balancing of all these factors is a complicated job requiring considerable experience in grinding. However, by knowing the factors involved, the machine operator can make minor adjustments in the operation to give better quality and better production at greater economy.

Coolants

Grinding, like all machining processes, develops considerable heat. To keep this heat as low as possible, most grinding operations are performed under a flow of coolant. Plain water can be used on some jobs, but because it will often cause the work to rust, rust deterrents such as soda compounds are added to the water. Where high finish is important, an emulsifiable oil is added to the water. Sometimes cutting oils will be required.

Since fine chips and abrasive dust are produced by grinding, some means of straining the fluid is included in the coolant system. To preserve clean coolants, the filters and coolant tank should be cleaned frequently.

This article is fifth in the "Tools of Our Trade" series. For the convenience of those desiring to use this material in operator-training programs, the five articles are identified as follows:

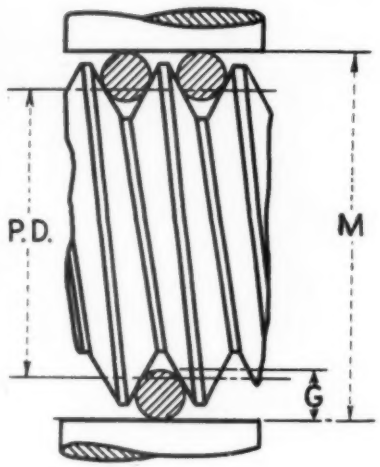
No. 1 — "Tools of Our Trade" — a picture dictionary of machine-shop tools, gages and measuring instruments. No. 2 — "How to Run a Drilling Machine." No. 3 — "How to Run a Milling Machine." No. 4 — "How to Run an Engine Lathe." No. 5 — "How to Run a Grinding Machine."

Reprints of any or all of these sections are available from the Editor, AMERICAN MACHINIST, 330 West 42 Street, New York 18, N. Y., at 10 cents a copy (less in lots over 500).

The preparation of this section would have been impossible without the cooperation of a great number of American grinding machine and grinding wheel manufacturers, and we are grateful to them for the information and illustrative material which they have supplied.

AMERICAN MACHINIST REFERENCE BOOK SHEET

Three-Wire Measurements of Screw Threads—I



BY JOSEPH F. HEATON

The three-wire method has long been used to measure screw threads, but in the past it has been necessary to compute the measurement over the wires. These tables avoid the necessity for calculations if "best wires" are used in measurement of American National coarse and fine series threads. If other than best wires are used, the micrometer reading must be calculated.

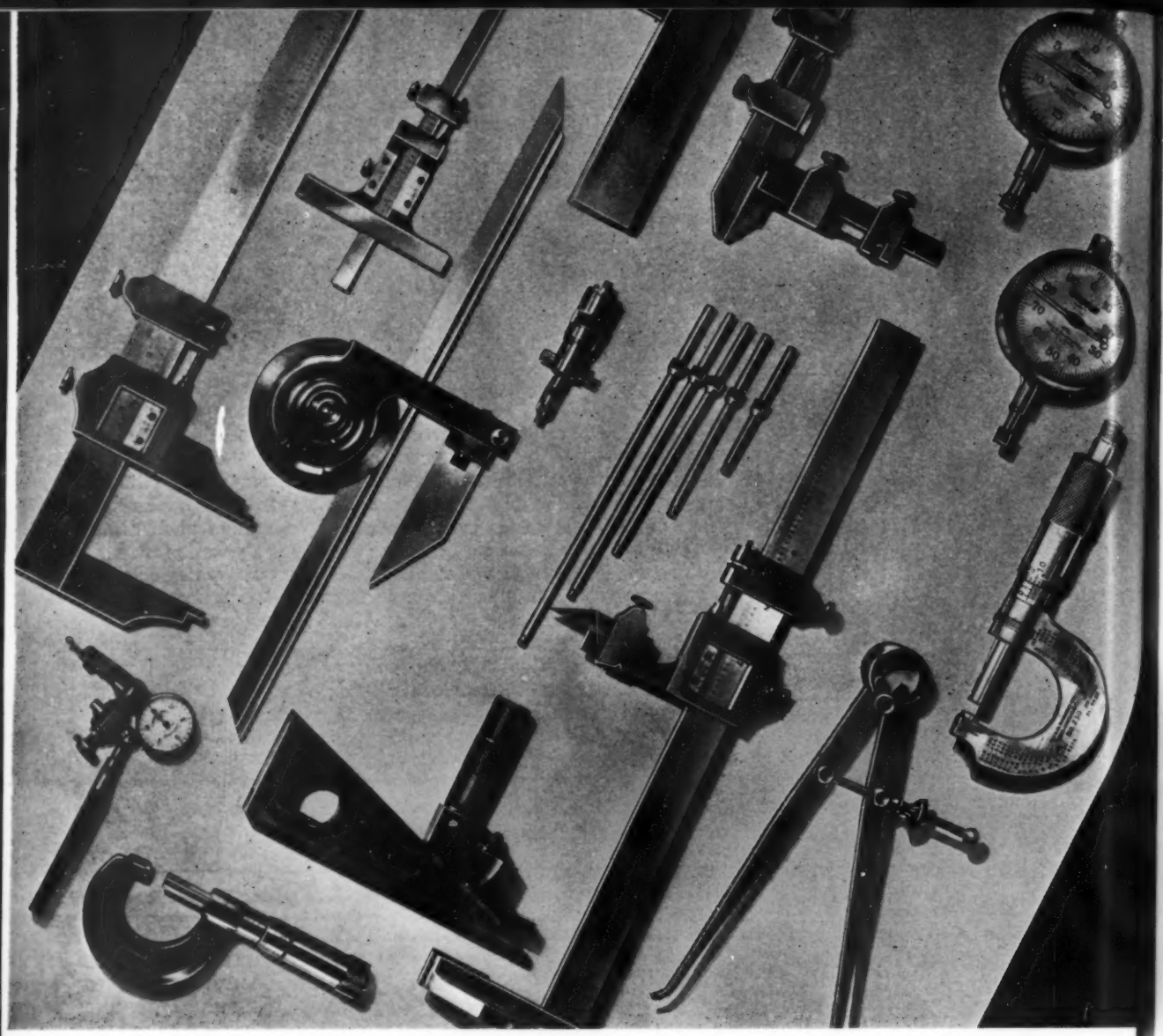
Best wire *G* is the size of wire that will contact the side of the thread at the pitch diameter. Maximum and minimum values for the measurement over the wires (shown at *M* in the accompanying illustration) are calculated on the basis of maximum and minimum pitch diameters permissible for a given American National thread. If the measurement over best wires falls between the stated maximum and minimum values, the screw thread has been made within the permissible tolerance.

(To be continued in an early number)

Class 1, Loose Fit, American National Coarse-Thread Series

Size	Threads Per Inch	Pitch	Major Dia. Max.	Depth of Thread	Pitch Dia. Max.	Best Wire Constant	Best Wire Size	Measurement Over Wires Max.	Measurement Over Wires Min.
1	64	.01562	0.07230	.01015	0.06215	.01353	.00902	0.07568	0.07308
2	56	.01786	0.08520	.01160	0.07360	.01547	.01031	0.08907	0.08627
3	48	.02083	0.09810	.01353	0.08457	.01804	.01203	0.10261	0.09951
4	40	.02500	0.11100	.01624	0.09476	.02165	.01443	0.11641	0.11301
5	40	.02500	0.12400	.01624	0.10776	.02165	.01443	0.12941	0.12601
6	32	.03125	0.13690	.02030	0.11660	.02706	.01804	0.14366	0.13986
8	32	.03125	0.16290	.02030	0.14260	.02706	.01804	0.16966	0.16586
10	24	.04167	0.18870	.02706	0.16164	.03608	.02406	0.19772	0.19312
12	24	.04167	0.21470	.02706	0.18764	.03608	.02406	0.22372	0.21912
1/4	20	.05000	0.24850	.03248	0.21602	.04330	.02887	0.25932	0.25422
5/16	18	.05556	0.31090	.03608	0.27482	.04811	.03207	0.32293	0.31723
3/8	16	.06250	0.37320	.04059	0.33260	.05413	.03608	0.38673	0.38043
7/16	14	.07143	0.43540	.04639	0.38901	.06186	.04124	0.45087	0.44387
1/2	13	.07692	0.49780	.04996	0.44784	.06662	.04441	0.51446	0.50706
9/16	12	.08333	0.56010	.05413	0.50597	.07217	.04811	0.57814	0.57024
5/8	11	.09091	0.62240	.05905	0.56335	.07873	.05249	0.64208	0.63358
3/4	10	.10000	0.74720	.06495	0.68225	.08660	.05774	0.76885	0.75965
7/8	9	.11111	0.87190	.07217	0.79973	.09623	.06415	0.89596	0.88596
1	8	.12500	0.99660	.08119	0.91541	.10825	.07217	1.02366	1.01256
1 1/8	7	.14286	1.12110	.09279	1.02831	.12372	.08248	1.15203	1.13963
1 1/4	7	.14286	1.24610	.09279	1.15331	.12372	.08248	1.27703	1.26463
1 3/8	6	.16667	1.37060	.10825	1.26235	.14434	.09623	1.40669	1.39219
1 1/2	6	.16667	1.49560	.10825	1.38735	.14434	.09623	1.53169	1.51719
1 3/4	5	.20000	1.74480	.12990	1.61490	.17321	.11547	1.78811	1.77121
2	4 1/2	.22222	1.99430	.14434	1.84996	.19245	.12830	2.04241	2.02401
2 1/4	4 1/2	.22222	2.24430	.14434	2.09996	.19245	.12830	2.29241	2.27401
2 1/2	4	.25000	2.49360	.16238	2.33122	.21651	.14434	2.54773	2.52733
2 3/4	4	.25000	2.74360	.16238	2.58122	.21651	.14434	2.79773	2.77733
3	4	.25000	2.99360	.16238	2.83122	.21651	.14434	3.04773	3.02733
3 1/4	4	.25000	3.24360	.16238	3.08122	.21651	.14434	3.29773	3.27733
3 1/2	4	.25000	3.49360	.16238	3.33122	.21651	.14434	3.54773	3.52733
3 3/4	4	.25000	3.74360	.16238	3.58122	.21651	.14434	3.79773	3.77733
4	4	.25000	3.99360	.16238	3.83122	.21651	.14434	4.04773	4.02733

STARRETT TOOLS



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Three-Wire Measurements of Screw Threads—II

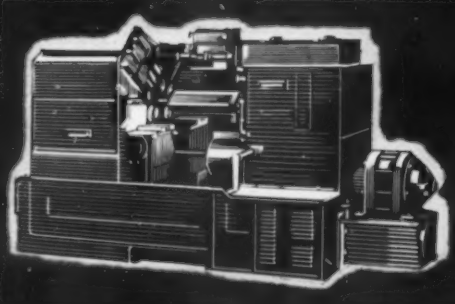
Class 2, Free Fit, and Class 3, Medium Fit

American National Coarse-Thread Series

Size	Threads Per Inch	Pitch	Major Dia. Max.	Depth of Thread	Pitch Dia. Max.	Best Wire Constant	Best Wire Size	Measurement Over Wires Classes 2-3 Max.	Class 2 Min.	Class 3 Min.
1	64	.01562	0.07300	.01015	0.06285	.01353	.00902	0.07638	0.07448	0.07498
2	56	.01786	0.08600	.01160	0.07440	.01547	.01031	0.08987	0.08787	0.08837
3	48	.02083	0.09900	.01353	0.08547	.01804	.01203	0.10351	0.10131	0.10191
4	40	.02500	0.11200	.01624	0.09576	.02165	.01443	0.11741	0.11501	0.11571
5	40	.02500	0.12500	.01624	0.10876	.02165	.01443	0.13041	0.12801	0.12871
6	32	.03125	0.13800	.02030	0.11770	.02076	.01804	0.14476	0.14206	0.14286
8	32	.03125	0.16400	.02030	0.14370	.02706	.01804	0.17076	0.16806	0.16886
10	24	.04167	0.19000	.02706	0.16294	.03608	.02406	0.19902	0.19572	0.19662
12	24	.04167	0.21600	.02706	0.18894	.03608	.02406	0.22502	0.22172	0.22262
1/4	20	.05000	0.25000	.03248	0.21752	.04330	.02887	0.26082	0.25722	0.25822
5/16	18	.05556	0.31250	.03608	0.27642	.04811	.03207	0.32453	0.32043	0.32153
3/8	16	.06250	0.37500	.04059	0.33440	.05413	.03608	0.38853	0.38403	0.38533
7/16	14	.07143	0.43750	.04639	0.39111	.06186	.04124	0.45297	0.44807	0.44937
1/2	13	.07692	0.50000	.04996	0.45004	.06662	.04441	0.51666	0.51146	0.51296
9/16	12	.08333	0.56250	.05413	0.50837	.07217	.04811	0.58054	0.57494	0.57654
5/8	11	.09091	0.62500	.05905	0.56595	.07873	.05249	0.64468	0.63878	0.64048
3/4	10	.10000	0.75000	.06495	0.68505	.08660	.05774	0.77165	0.76525	0.76715
7/8	9	.11111	0.87500	.07217	0.80283	.09623	.06415	0.89906	0.89206	0.89416
1	8	.12500	1.00000	.08119	0.91881	.10825	.07217	1.02706	1.01946	1.02166
1 1/8	7	.14286	1.12500	.09279	1.03221	.12372	.08248	1.15593	1.14743	1.15003
1 1/4	7	.14286	1.25000	.09279	1.15721	.12372	.08248	1.28093	1.27243	1.27503
1 3/8	6	.16667	1.37500	.10825	1.26675	.14434	.09623	1.41109	1.40099	1.40399
1 1/2	6	.16667	1.50000	.10825	1.39175	.14434	.09623	1.53609	1.52599	1.52899
1 3/4	5	.20000	1.75000	.12990	1.62010	.17321	.11547	1.79331	1.78171	1.78541
2	4 1/2	.22222	2.00000	.14434	1.85566	.19245	.12830	2.04811	2.03541	2.03921
2 1/4	4 1/2	.22222	2.25000	.14434	2.10566	.19245	.12830	2.29811	2.28541	2.28921
2 1/2	4	.25000	2.50000	.16238	2.33762	.21651	.14434	2.55413	2.54013	2.54443
2 3/4	4	.25000	2.75000	.16238	2.58762	.21651	.14434	2.80413	2.79013	2.79443
3	4	.25000	3.00000	.16238	2.83762	.21651	.14434	3.05413	3.04013	3.04443
3 1/4	4	.25000	3.25000	.16238	3.08762	.21651	.14434	3.30413	3.29013	3.29443
3 1/2	4	.25000	3.50000	.16238	3.33762	.21651	.14434	3.55413	3.54013	3.54443
3 3/4	4	.25000	3.75000	.16238	3.58762	.21651	.14434	3.80413	3.79013	3.79443
4	4	.25000	4.00000	.16238	3.83762	.21651	14434	4.05413	4.04013	4.04443

Class 4, Close Fit, American National Coarse-Thread Series

Size	Threads Per Inch	Pitch	Major Dia. Max.	Depth of Thread	Pitch Dia. Max.	Best Wire Constant	Best Wire Size	Measurement Over Wires Max.	Min.
1/4	20	.05000	0.25000	.03248	0.21782	.04330	.02887	0.26112	0.25982
5/16	18	.05556	0.31250	.03608	0.27672	.04811	.03207	0.32483	0.32333
3/8	16	.06250	0.37500	.04059	0.33480	.05413	.03608	0.38893	0.38733
7/16	14	.07143	0.43750	.04639	0.39151	.06186	.04124	0.45337	0.45157
1/2	13	.07692	0.50000	.04996	0.45044	.06662	.04441	0.51706	0.51516
9/16	12	.08333	0.56250	.05413	0.50887	.07217	.04811	0.58104	0.57904
5/8	11	.09091	0.62500	.05905	0.56645	.07873	.05249	0.64518	0.64308
3/4	10	.10000	0.75000	.06495	0.68565	.08660	.05774	0.77225	0.76995
7/8	9	.11111	0.87500	.07217	0.80343	.09623	.06415	0.89966	0.89726
1	8	.12500	1.00000	.08119	0.91951	.10825	.07217	1.02776	1.02506
1 1/8	7	.14286	1.12500	.09279	1.03301	.12372	.08248	1.15673	1.15373
1 1/4	7	.14286	1.25000	.09279	1.15801	.12372	.08248	1.28173	1.27873
1 3/8	6	.16667	1.37500	.10825	1.26765	.14434	.09623	1.41199	1.40839
1 1/2	6	.16667	1.50000	.10825	1.39265	.14434	.09623	1.53699	1.53339
1 3/4	5	.20000	1.75000	.12990	1.62110	.17321	.11547	1.79431	1.79021
2	4 1/2	.22222	2.00000	.14434	1.85676	.19245	.12830	2.04921	2.04481
2 1/4	4 1/2	.22222	2.25000	.14434	2.10676	.19245	.12830	2.29921	2.29481
2 1/2	4	.25000	2.50000	.16238	2.33892	.21651	.14434	2.55543	2.55063
2 3/4	4	.25000	2.75000	.16238	2.58892	.21651	.14434	2.80543	2.80063
3	4	.25000	3.00000	.16238	2.83892	.21651	.14434	3.05543	3.05063
3 1/4	4	.25000	3.25000	.16238	3.08892	.21651	.14434	3.30543	3.30063
3 1/2	4	.25000	3.50000	.16238	3.33892	.21651	.14434	3.55543	3.55063
3 3/4	4	.25000	3.75000	.16238	3.58892	.21651	.14434	3.80543	3.80063
4	4	.25000	4.00000	.16238	3.83892	.21651	.14434	4.05543	4.05063



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More Than a Pittance

NO ONE will take issue with the policy that no profiteering should be permitted in this war. Profiteering is indefensible at any time. It is execrable while American soldiers are fighting in all parts of the world.

But in our laudable zeal to guard against profiteering, our economic system must not be strangled and its future imperiled. Nor must our national security be jeopardized by so weakening the financial structures of vital industries that they may find it difficult if not impossible to survive after the war.

And that brings up again the subject of the renegotiation of war contracts.

As operated to date, renegotiation tends to remove the incentive for efficiency. It penalizes skilled management that is capable of producing at lower costs and encourages manufacturers whose costs are high and who therefore make less profits.

To negotiate is "to conduct conferences as a basis of agreement." If our informants are right, renegotiation in many instances has been a one-sided affair. The contractor appears much as a defendant in court and states his case. The renegotiation board is both prosecutor and judge. It does all the examining, after which it renders a verdict.

If renegotiation is here to stay for the duration, the least that can be done is to make sure that it does not undermine our economic system by taking away from manufacturers the finances that will constitute their life-blood in the years following victory.

Hundreds of companies the past few years have been making war products that differ in no essential respect from their peacetime products. In going all-out in the war effort, they are so saturating industry with these products, easily convertible later to peacetime production, that they are now supplying their markets for years ahead. They literally are crowding ten years' business into but two years.

Yet the disturbing thing is that no official cognizance has been taken of this situation. These companies are being asked to surrender in renegotiation all but a pittance of the profits made in one or two top years, though they know from bitter experience that these profits should be put away for use in keeping their businesses alive and in trying to provide jobs after the war.

Who would be so shortsighted as to come forward and with a single stroke cripple these companies so essential to our national safety and, one should add, to our peacetime economy too?

Yet that is what will happen unless the renegotiation boards can be made to see the necessity for special treatment or unless the present law is amended by Congress.

Aside from the problem of survival, the task of reconversion will be the most gigantic and complex that American industry has ever tackled in peacetime. The more speedily it is accomplished, the better chance there will be for preserving the economic system that has made this country the envy of the world.

That task will take billions upon billions of dollars. Industry will be ill-prepared for it unless it is permitted to accumulate adequate post-war reserves now. That means allowances for such reserves in our tax system and in renegotiation.

In connection with renegotiation, the Navy has gone on record as favoring allowances for such reserves. Congress should amend the law by writing into it that provision.

More than a pittance of profits must be retained by manufacturers if our industries are to stay strong for our security's sake and to do their part in generating prosperity after the war.

Burnham Finney

Gaging Business

Military plans are already affected by the drop in war production. One important campaign has been put off because of the very sharp drop in output in one engine plant and one plane plant following charges of the Truman investigating committee.

Accumulated effect of other serious examples on military plans may soon become critical. More output per man-hour is WPB's solution to what they hope is a temporary crisis in production. Plant-wide increases in income, based on increases of output by the plant as a whole, are to be pushed as the way to get more individual effort.

War Labor Board approval of the new policy has been obtained. The policy was decided upon after surveys showed heavy bomber production could be lifted 60 percent, naval plane output by 40 percent. How far the plan will be extended is still a question.

Two 10-hour shifts instead of three 8-hour shifts have been urged upon West Coast plant builders by WPB's C. E. Wilson because of manpower shortages. He also plans a drive to recruit 300,000 new workers.

In a shift of plans auto makers will stop making parts for a two-motor bomber and change over to heavy-bomber components. First fighter plane to be developed by an automotive company will be tooled up soon.

Despite the depressing effect of the new 48-hr. week, the steel industry chalked up a new record the week ending August 28. Weekly output is expected to gain this fall as new units come into production.

Few people comprehend the tremendous expansion that has and is taking place in the steel industry to achieve the 96,000,000-ton goal by early 1944. Yet there is great urgency by the services to take the entire output, regardless of civilian demand.

Steel leaders do not look for a smooth transition from war to peace. The military will press for the last pound until the war ends, and government seems to have no plan for a gradual tapering of its demands.

Machine tool orders dropped 30% in July; shipments declined to $98,000,000. Builders are anxiously searching for new work, some have landed sub-contracts. Problem with the builders is the purchase of new machines required to undertake some jobs.

Government recognizes the need for maintaining machine tool plants in condition to meet sudden war requirements. Latest proposal is that all machine tools needed by the British be made in American plants, and the English workers be transferred to other jobs requiring their skill.

If this plan goes through, the net effect on the domestic machine tool situation is not likely to be pronounced. British machine requirements have fallen off in recent weeks.

Union Must Shoulder Member-Control Responsibility

The era of irresponsible swashbuckling by power-drunk unions seems to have passed with WLB evincing enough backbone to punish UAW-CIO for series of wildcat strikes

NEW YORK—The refusal of a unanimous National War Labor Board to grant C.I.O.'s United Automobile Workers Union a maintenance of membership contract in Chrysler Corp. plants is not only a signal victory for management but a development of fundamental importance in industrial relations. The Chrysler decision is NWLB's first major case in which union maintenance was denied, and the first case of any kind in which the labor members of the board joined public and business representatives in voting down a union demand for "security."

The board's action was officially explained as being punishment for a series of wildcat work stoppages that has hampered Chrysler's war production for more than a year. To give the union an incentive for keeping the peace, NWLB told it to come back in six months for a review of its demand, implying that if responsibility and contract observance was meanwhile demonstrated it could then have its maintenance of membership. But, although it is not officially admitted, it is an open secret that Chrysler's able brief which emphasized factional dissention within U.A.W. was an important reason why the board rejected the union's appeal.

A New Front

This is the important development which the Chrysler case marks, and industry owes a debt of gratitude to the company's management for being bold enough to open a new front in the fight against union excesses. Since the validation of the National Labor Relations Act by the Supreme Court in 1937, industry has been extremely reluctant to manifest an interest in internal union affairs. Active "meddling" is, of course, strictly forbidden by the Wagner Act, and any attempt to exert an influence over union activities is a punishable unfair labor practice. Naturally fearful of invoking the wrath of a zealot-staffed National Labor Relations Board, industry was not only scrupulously careful to live up to the letter of the law, but it went further and imposed upon itself limitations that no valid interpretation of the statute could have demanded. For all practical purposes it shut its eyes to what went on in the unions it had to deal with.

The situation in U.A.W. that was bedevilling Chrysler can, in a somewhat less intense degree, be duplicated in most of the big industrial unions. A bitter factional fight between the "lefts" and the "rights," the Communists and anti-Communists, complicated by the ever-present jockeying for power by ambitious leaders, wracks U.A.W. from top to bottom. More than any other single factor, it explains why Chrysler had a continuous plague of labor trouble, and it would have carried an ostrich-like policy to absurd lengths if Chrysler management had ignored it.

Facts Were Presented

Instead, Chrysler came before the National War Labor Board and said, in effect, this is a bad union, look at its record; we present information that we have not hired spies to dig out but which is a matter of public information, now do you dare give an irresponsible organization like that security and saddle us with it forever after? And the board, with even its labor members joining the chorus, had to answer "No."

Consequently, thanks to Chrysler, it has now become obvious that an employer not only has a right but, in the interests of good management, has an obligation to interest himself and follow closely the intramural activities in the union with which he deals. Not only will he thus have invaluable insights into what he's up against, but he will have information which may have a decisive effect in collective bargaining and in proceedings before a government tribunal.

Navy Contract Would Encourage Lower Costs

WASHINGTON—The Navy has instituted a type of contract designed to eliminate future renegotiation troubles and to give the manufacturer an incentive toward reducing costs. Basicly it gives a guarantee of protected costs to a limited degree, and has a sliding price scale. The contract arrangement is available to any Navy contractor on items of which the costs have been or can be estimated with reasonable accuracy.

When contracting, a price is agreed upon which experience has shown to be fair. It is also agreed that the Navy will pay additional costs up to a certain ceiling, or that the contractor will share in the form of extra profits if he reduces costs below a certain floor. The proportion of sharing of the additional savings by the manufacturer depends upon circumstances, and is fixed in advance in each contract. The manufacturer with the greater risk will be allowed greater costs and increased participation.

Fitted to New Production

The new type of contract is regarded by Navy officials, and by those companies which have had experience with it, as particularly well adapted in cases where a mnufacturer is undertaking production of a precision instrument for the first time, and which has been previously turned out by another company.

Not all Navy procurement is susceptible to this type of contract. The procurement must be of a nature permitting a reasonably close estimate of the cost of production. Therefore, experimental items and new products could not always be included.

Packard Produces New Engine for High-Altitude Fighters

DETROIT—A new super-airplane engine to power the deadly P-51 *Mustang* fighter, labeled by military experts the outstanding plane of 1943, is now in volume production by the Packard Motor Co. The engine incorporates a two-stage, two-speed supercharger that increases engine horsepower past the 1500 mark and raises the ceiling for warfare two miles above present levels.

In explaining the features of the new supercharger, George T. Christopher, Packard's president, pointed out that it has two small multi-bladed rotors, or stages. "In the two-stage supercharger," he explained, "the first rotor compresses the air much like a single-stage supercharger. The air is then passed immediately to the second rotor where it is compressed once more. Thus, at levels several miles up, the air is compressed to six times the surrounding atmospheric pressure. Net result is the maintenance of high power at high altitudes where the enemy has not yet shown anything similar."

The supercharger represents perfection of a British idea, its two speeds in connection with two stages provides the fighter pilot with exceptional climb and speed characteristics at other maximum flying levels. Parts for the device are built at the new Toledo plant to close limits for precision. Assembly of the supercharger is done at the Packard plant in Detroit.

Big Shots See Rifle—Maj. Gen. Levin H. Campbell, chief Army Ordnance, points out the nomenclature of a rifle to (l. to r.), presidents B. F. Fairless, U. S. Steel Corp., and E. G. Grace, Bethlehem Steel Co., and Chairman W. F. Detwiler, Allegheny-Ludlum Steel Corp., during a recent inspection tour of Aberdeen Proving Grounds by Steel Industry Advisory Committee, WPB

Announce Stabilized Pay Rates; Shortage Promotes New Process

PITTSBURGH—Seeking to speed action on many applications alleging gross inequities between wage rates paid in different plants in the same industry and area, the Regional War Labor Board in Philadelphia has announced stabilized rates of pay for machine shop and office workers in Pennsylvania, Southern New Jersey, Maryland, Delaware and the District of Columbia. Sylvester Garrett, regional board chairman, explained the rates constitute levels up to which employers and unions may ask to advance wages with reasonable expectation of board approval.

Employers are not compelled to raise present wages or salaries to the levels set by RWLB. Raising of the wages to the stabilized levels cannot be made without an application to the board. Setting up such rates will enable the board to act on all wage adjustment cases for that industry by comparing the rates now paid in the applicants' plant with the rates set up by the board, and extensive analysis for each case is eliminated.

Electrolytic Method Is In

The death knell of the hot-rolled method of tinplate manufacture will be sounded September 1 with the closing of the Washington Tinplate Co., Washington, Pa., the country's last of the old hand-operated, hot-rolled, hot-dip tinplate mills. In less than 14 years after the Wheeling Steel Corp. pioneered cold-reduced tinplate, the hot-rolled process has been supplanted by the cold-rolled method.

As one cycle in tinplate manufacture is completed, another one is well underway, with war restrictions on tin stimulating the use of the electrolytic process in spreading tin on steel sheets. The Japanese grab of the principal tin-producing countries made it necessary for the United States to spread its tin supplies thin, and the electrolytic method, using ½ lb. of tin to 100 lbs. of sheet metal, sprang into prominence over the hot-dip process, which requires three times more tin, and for which government decree now allows but 1¼ lbs.

Twenty-four electrolytic tinplate lines, many completed within recent months, are being operated by 12 steel companies, and four other lines under construction, will be in operation by year's end. But what these lines will produce this year is problematical because of installation delays owing to priorities, and resistance of some food-packers to the thinner coating of the electrolytic process until exhaustive tests have been made. Electrolytic production may reach 15,000,000 base boxes this year, a third of the total tinplate expected to be produced. A recent order of the WPB, making it mandatory for manufacturers to use light-coated electrolytic plate in cans for packing many vegetables and milk products after Sept. 30, will be another boost for the newer method.

Steel on Wheels

In an effort to glamorize the steel industry and show what part its production has in the war program, a caravan of ordnance material, escorted by six Navy veterans of combat service, is making a 30-day tour of basic steel mills in the Pittsburgh area, to show workers the type of material needed and the sort of men who fight with the weapons steel provides. The production of 51,242,929 net tons of steel in the first seven months of 1943 indicates a record mark of 90,000,000 tons this year—4,000,000 tons above last year but under the 91,500,000 tons sought by the government.

Informer Wins Suit

Of interest to firms holding government contracts is the decision of a group of Pittsburgh electrical contractors to settle a $315,000 judgment returned against them by a federal court jury in 1941, by paying $260,000 to Morris L. Marcus, who, in an "informer's" suit, charged the contractors with bid-rigging on 56 PWA projects. Bringing the court action under the Civil War "relator's" act, passed in 1863 to protect the government from contract frauds by permitting individuals to sue for twice the amount of the fraud, Marcus split 50-50 with the government. After the U. S. Supreme Court last January upheld the ancient statute, a flurry of "informer's" suits were filed against companies holding government contracts, and pending in federal courts are 28 suits for a total of $69,000,000.

CIO-UAW Loses Elections

The CIO United Steelworkers of America has just suffered two setbacks in its five-year campaign to organize workers of the American Rolling Mill Co. First the employees at the Butler, Pa., Armco plant, in a National Labor Relations Board election, voted 1121 to 1161 against the CIO union as their bargaining agent. A week later, workers at the Zanesville, Ohio, factory voted in favor of an independent union, 356 to 333. An election will be sought later at the Middletown, Ohio, works by the CIO. Last March, the United Steelworkers won at the Ashland, Ky., Armco plant by a 73-vote margin, 1,040 to 967. The only other major steel company not under contract to the CIO is the Weirton Steel Co.,

Inside Detroit

The automotive industry is leaving it to Washington to outline means of producing a million trucks without extra facilities. Auto companies have their postwar planning done by outside organizations. Truman investigation hasn't cut output

BY SILER FREEMAN

Pile Trucks on Arms Program Another big job seems about to be thrust on the shoulders of the automotive industry and although it's a job it would ordinarily be glad to assume, the industry right now is looking askance. The task which it is being charged with is a huge truck program, both military and civilian.

The reason it is quizzical about the program is that, like the armament job that was thrust upon it so suddenly after Pearl Harbor, the truck production figures which came out of the blue are too heavy for facilities and manpower at the present time. Something must give way and, again like the armament job, it is asking the government to decide what it wants most, arms or trucks.

Estimate Trucks At a Million R. L. Vaniman, director of the automotive division of WPB, on a recent visit here, told a couple of newspaper interviewers something about an 80,000-truck program for 1944. But the same afternoon, before an industry committee, he placed the total requirements, military and civilian, at a million. He put out some feelers as to the companies' attitude to such a program, expecting to find it more than receptive.

But the industry has become wise to Washington. It takes nothing for granted but sits back and says, "Well, how do you propose that we can accomplish this miracle?" The manufacturers want to know just how near the million figure the planners expect to reach. They want to know whether it will be a figure for the entire year or monthly quotas it will be expected to reach.

A Choice: Guns Or Trucks? Facilities are the main problem. Most of the plants, in spite of contract cancellations and cutbacks, have their facilities pretty well tied up. They want to know what the services want most, the products the industry is now producing or the trucks. There is no doubt that both goals cannot be reached simultaneously.

There is also some feeling among the auto people that the sudden surge for trucks may be another program like the tank schedules set up at the beginning. Goals were overestimated. They want nothing like that again, are trying to guard against it.

Prospects Are Not Good WPB has been holding individual meetings with parts manufacturers to see just how the goal may be attained. It has met with ball bearing makers, gear and axle manufacturers, etc., and is polling the various divisions on how near they could come to the million-truck figure. So far the word is that the outlook is not too encouraging.

The heavy truck program is especially a poser. It is set at 158,000. The preliminary specifications of the supertrucks which may be used in supplying the invasion armies present a task as huge as getting into tank production. In this, may be the solution. The falling off of tank orders may place the facilities to work on the monsters for Europe. Still, there's the bottleneck in gears, axles and transmissions.

The general feeling in the industry

NEW PLANES FOR AUTO MAKERS

DETROIT—In a sweeping revision of Army Air Force plans, Fisher Body Division, General Motors has been told to stop plans for future assembly of the B-29, a new huge Fortress, and to tool up for a new fighter plane designed by Don Berlin, GM's aviation expert. Production of B-29 parts will continue, however, for shipment to assembly plants elsewhere.

Concurrently the B-26 bomber program has been cancelled, and Chrysler, Goodyear and subcontractors have been ordered to swing over to manufacture of B-29 parts. Since recent cancellation of Ford's $60 million tank contract, plant space is being converted to plane manufacture. Packard's Rolls-Royce motor is now being used in the new Mustang fighter.

Dies for Defense—In Detroit on a tour of war plants, Gerard Swope, president, General Electric Company, right, is shown by W. G. Robbins, president, Carboloy Company, the fifty thousandth cartridge case die produced since Pearl Harbor by his company. Each die is estimated capable of drawing at least several million cartridge cases. It was this type of die that enabled conversion of cartridge cases from brass to steel

is that the program will have to be pared, if not shaved. In the end, it may be the civilian truck needs that will suffer.

Dreams and Plans Persist

George Romney, managing director of the Automotive Council for War Production, has often shaken a warning finger at talk of new car production for civilians. Yet the talk persists. WPB Auto Division Chief Vaniman has a curt "no" to questions as to possibilities of resumption of passenger auto output.

But the recent successes have spurred talk of post-war planning. Even in firms busily engaged on war contracts the talk has gained headway. In some cases, it has been more than mere talk.

Not that any company has set engineers to work or turned over any materials or ordered its designers to go into some out of the way corner and dream something up. As one engineering chief pointed out, that would bring many woes, not the least that their staffs would lose their draft deferments or would immediately change over to some other firm strictly on war work, thus saving themselves from the draft.

WAR RULINGS IN BRIEF

Cheklist of Significant Regulations on Materials and Prices

ABRASIVE PRODUCTS—Resinoid and vitrified bonded abrasive wheel stubs have been provided with specific dollars and cents maximum prices. These prices are applicable to stubs with a grit size of 60 or coarser when the abrasive grain is silicon carbide or aluminum oxide. (Amendment 1, Maximum Price Regulation 316.)

ALUMINUM PRODUCTS—Regulations governing acceptance of purchase orders in the form of controlled materials have been clarified, and amount of reporting has been reduced with respect to orders delivered later than the requested delivery date. (Controlled Materials Plan, Direction 23, Regulation 1.)

GAGES—Production of standardized and simplified welding apparatus gages has been ordered. New schedule limits sizes and prohibits manufacturer from placing customer's name or trade mark on the dials. (Schedule VI, Limitation Order L-272.)

HEAT EXCHANGERS — Purchase orders authorized prior to July 9 are subject to the scheduling provisions of the order unless otherwise directed by WPB in a particular case. The amendment also states that a tube bundle or shell or pressure vessel, for replacement in a critical heat exchanger in Group I or Group II, is included in its respective group. (Amendment I, Limitation Order L-172.)

Compass Testing— A 20 deg. angle test to determine the freedom of rotation is being given a transmitter of the remote reading magnetic compass now being produced by the Ternstedt aircraft instrument plant, Fisher Body Division, General Motors. The transmitter is placed in the airplane wing or other points relatively free from magnetic influences and the compass bearings transmitted electrically to the indicator on the instrument panel

It's Done Outside

Lots of free-lance designing firms are unashamedly accepting commissions to work on post-war products. So far, none admits to doing work on car models but almost every other product is covered. They say they have more work than they can handle. All is for the post-war market as each manufacturer becomes uneasy that his rival is planning to beat him to the rich gravy field when the war ends.

Although the auto firms will indignantly deny they are even thinking of post-war cars and re-assert that the 1942 will be the model that they will bring out no matter when the war ends, you just can't stop a car designer from dreaming. Those who prowl about the automotive companies have frequently run across a small wooden model on top of a desk.

Certainly it is a bit different from the mockups the auto designers once concentrated on. But it shows they are still set in their old habits and will have at least a thought on what they want the public to have in the not too distant future. Their fingers as well as their minds do stray.

Not Flustered By Inquiry

While certain plants visited by the Truman committee have fallen off on production following the trips of the doughty Washington inquisitors, the automotive plants go on their even way. One aircraft plant, investigated by the senators, was reported to have fallen off 66 percent because of the tightening up of inspection and the "passing the buck" tactics employed so as not to fall into the Truman clutches.

But Detroit plants continue to produce and the boast is that no investigations are needed to keep the company, government and Army inspectors on their toes. Their standards have always been high, they state, and they have nothing to fear from any investigatory body.

Been Doing it For Years

Even the Bohn indictments have failed to shake that philosophy. No falling off of production because of tightened standards has been reported. This, of course, is no invitation for congressional committees to come here and do something about it.

The Bohn indictments are being given a heavy pooh-pooh from engineers. The practices of which they are accused, it is claimed, have been in wide use throughout the industry and have gone into technical journals and papers before engineering societies. In fact, it was pointed out by one engineer, that a manual from Wright Field, back in 1927, outlined the procedure which was followed by many airplane engine manufacturers for years. Investigating bodies apparently are none too interested in looking into the facts where technicalities are involved.

ISSUES TERMINATION RULES

WASHINGTON—Faced with necessity of making a string of cutbacks and cancellations due to the reshuffling of the war program, the Army has issued Procurement Regulation 15, a multiple-page codification of policies it has tried to follow all along. It is intended as a general guide to procurement officers handling termination cases, and the individual settlement will be governed by the various termination clauses written into the Army's contracts. Army still participates in the procurement agencies' committee which, with WPB, has been striving to draw up a standard termination clause; it simply couldn't wait for another month or six weeks for that clause to be finally agreed upon.

Wartime Washington

Producers believe the uniform termination clause has much of value but still leaves a lot to be desired. Indications are that surplus machinery will be junked if no immediate use is available. Sales offices for surplus equipment set up.

Picture is Clarifying Now that the uniform termination clause has been redrafted in keeping with some of the suggestions made by business leaders, and has been resubmitted for further comment, their composite opinions are beginning to gather into a definite picture.

There seems to be a general agreement that it goes a long way in the right direction, as compared to the original proposal, but that certain fundamental changes are still necessary, especially to clarify the thinking as to just how this termination shall be effected. The big question right now hinges on whether termination shall be channeled through prime contractor, or whether there shall be a mechanism set up whereby the government can settle directly with subcontractors. The Army wants to settle through the prime contractor, and has so set up its procedures, as enunciated in its just-issued Procurement Regulation 15.

The Murray Bill, which will be formally introduced in Congress when that body reconvenes in mid-September, would set up such a mechanism. Industry itself seems to be split over the type of settlement, as well as disagreeing over the amount it needs to receive as termination profit. The split seems to be along lines of raw material suppliers on one side, whose basic product has been the same through the war, and will continue the same in the peace, and the manufacturers who have had expensive conversions, will have more before they can get back into their normal production.

As Industry Sees the Need Industrialists generally agree on certain points with respect to contract terminations: That there needs to be legislation setting down certain standards; that the subject is so complex that agreement is possible in legislation only on broad principles and not on detail; that any approach should basicly consider at least two classifications of industry for separate treatment, i.e., manufacturers and fabricators on one hand and raw material suppliers on the other; that legislation must determine the basis of settlement, the time element and the audit; that there be some definite provision for the disposal of materials; and that uniformity of settlement procedures exist throughout all procurement agencies.

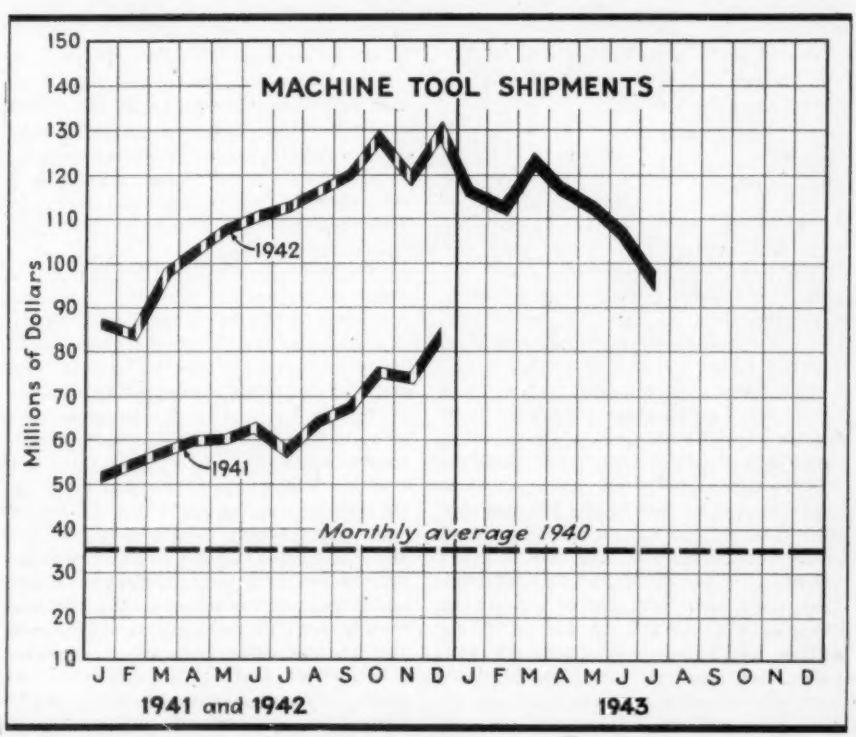
Mechanism Thought Bulky There has been expressed some objections to making the proposed regulation mandatory, since some believe the contracting officers should have some discretion to settle things with consideration of circumstances. The principal objection seems to be a belief that the set up is too complicated and time-consuming, and would cause undue hardships; after all, producers newly released from war production and straining to get back to turning out peacetime goods want 75 or 80 percent of their settlement quickly for peacetime capital. After that, they're willing to wait and argue about the balance.

Rate of Profit Is Argued Manufacturers are arguing that the "basic amount," does not include all the costs, and would be less fair to those whose contracts might be terminated during the early, high cost, period of production. Others object to a fixed rate of termination profit being determined at the time the contract is made, asserting that costs and production savings can't be forseen that far in advance. There are some objections to a 4 percent profit being set on unfinished goods, since it might be okay for industries with comparatively light investments, while not adequate for producers of capital goods. As a whole, they would prefer profits on uncomplete portion to be paid at the rate of the finished product.

The clause does not make provision for adjusting the accounts of sub-contractors below the first degree.

Won't Pay for New Equipment The status of equipment on order is objected to, since certain paragraphs specifically exclude such payments. However, it is realized that the smart producer would have inserted in his original contract a provision that the government would take over all such equipment or equipment contracts, unless it be of a nature he could use in further peacetime production.

Will Sell or Junk Surplus Indications are that a realistic, businesslike attitude will be assumed toward surplus



More Sharply Downward—After a 5 percent decline from May to June, machine tool shipments dropped 9 percent during the next month to an estimated $98,000,000 in July

Rubber Guard — A strip of rubber, made to conduct electricity through addition of chemicals, is placed on the leading edge of each propeller blade, after which passage of electricity warms it and keeps ice from forming. Dr. Louis Marick, U. S. Rubber Co., who developed the device, here displays it. It is expected that the principle used will be applied to other anti-icing problems in military and civilian aircraft

equipment. If some federal agency does not want a certain piece of equipment, and if the contractor in whose plant it rests can use it or dispose of it, the government will be glad to have him do so. On the other hand, if the government can use it, or the contractor does not want it, it will be removed. According to strict technicality of present contracts, equipment which procurement agencies have installed in war plants will revert to federal ownership; however, quantities of equipment left over from past wars are said still to repose in useless, and costly, storage. It is probable that equipment for which there is no immediate use, or for which there exists no clearly predictable future use, will be junked, rather than being allowed to accumulate.

Setting up Sales Offices

Treasury Procurement Department, working in conjunction with WPB's Redistribution Division, will offer for sale the considerable accumulation of construction machinery the various procurement agencies gathered together during the preparatory stages of our production effort, plus that of NYA and PWA. After inventories have been completed, surplus machine tools and equipment will be similarly offered in sales offices set up in WPB regional offices, where they will work in conjunction with the WPB Redistribution Office. The hiring of a national sales manager for this material is understood to be about consumated. The tools and equipment will be so channeled by WPB as to fulfill requests for priority to purchase new items, thereby relieving the pressure on producers of such. The regional offices may sell only on certification of WPB that a certain contractor should be allowed to purchase given equipment in order to further the war effort. If the equipment or machinery is in need of reconditioning, WPB may certify that it may be sold to a dealer for rebuilding and sale.

The WPB Redistribution Division seeks to get anything idle or in non-essential use into war production. Its activities cover everything but real property.

Has Official Sanction

This thinking is further supported by a memorandum of Under Secretary of War Robert P. Patterson, in procurement Regulation 15, codifying termination policies: "In many instances, work in process must and should be sold as scrap for scrap prices. Under present circumstances, no materials should be hoarded merely in the vague hope that at some future date the property may have a future use or a greater value.

"You will order your contracting officers to pursue a vigorous policy of disposing of such property, promptly and intelligently.

"The same policy must be applied to obsolete or unneeded machinery and equipment. Where it has no suitable use in production it should be disposed of promptly so that the scarce and critical materials out of which it is made can be used in the manufacture of new vitally needed instruments of production."

With slight changes, this sale of equipment and materials by the Treasury Procurement Department is but a continuation of an old, established procedure. The only difference is the quickening of the deals by the elimination of heretofore-required sealed bids and by the establishment of regional sales offices and by the limitation of sales to producers certified by WPB. Prices to be received for the equipment will be determined by the government procurement agency concerned.

Producers East of Mississippi Not Excited Over Manpower

WASHINGTON — Producers have reached the point of taking their manpower troubles philosophically. So many conflicting plans and prophesies have been issued during recent months that they have become hardened to the uncertainties. Midwest and East Coast manufacturers have become convinced that they are going to lose more men, and that they'd better hire old men, handicapped workers and women as fast as possible. Other than that, they're taking manpower troubles in their stride.

It is believed that West Coast manpower trouble results largely from rapid and extensive industrialization of the area, with the consequent necessity of importing workers.

Concerning the fluctuating announcements of plans to draft fathers, industry realizes that their losses will be lessened by the new critical list and that they can probably fill the vacancies of those who go. Indications are that the fathers are being slower than single men in making shift to essential jobs. Maybe there have been so many conflicting stories about taking fathers that they are no longer impressed. Or, as one father put it, the bombardment of conflicting announcements had him so confused that he didn't know whether to "fight, fish or run a foot race."

Probably realizing the poor effect on manpower and management of the rapid shifting of "we're-going-to-get-you" draft announcements, and wishing to make an experiment, West Coast aircraft manufacturers have been granted a 60 day blanket deferrment, just to let them prove whether they can boost production when not bothered by losing employees.

There are still some plants with plenty of labor applicants.

ISSUES TERMINATION RULES

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Spotting The Air News

The manpower shortage, blamed for leveling-off production in West Coast aircraft plants, is being studied from three angles by WPB and service procurement officials. Labor turnover experiment is being made at Bell. Grumman reveals production

West Coast aircraft producers are getting triple attention paid by government production officials to their manpower problems. The Aircraft Production Board and Charles E. Wilson, WPB executive vice chairman, recently returned from a trip to the Coast, where they discussed with members of the West Coast Aircraft War Production Council, plans to alleviate the severe manpower shortage.

Wilson is seeking to convince management and workers that two 10-hr. shifts would be more advantageous than three 8-hr. shifts where plant and community facilities are available. He is also interested in incentive pay and is said in Washington to have told Treasury officials that he was much more interested in increasing production by any means than in "holding the line" against inflation. He believes that workers could earn up to 30 percent more by increasing production.

Accompanying Wilson on his trip were: T. P. Wright, director of Aircraft Resources Control Office; Rear Adm. E. M. Pace, Jr., Navy Procurement, and Brig. Gen. Ben Chidlaw, AAF Materiel Command, and Frank Russell, manager of NAWPC. Lt. Gen. William S. Knudsen, War Department Production, and Under-Secretary of War Robert Patterson joined in Los Angeles.

Working on an additional plan to keep the airplanes flowing from the assembly line is Dr. A. E. Lombard, Jr., chief, Manpower Division of ARCO. He is tackling the problem from the point of view of the aluminum plants where labor is so scarce that it may hold up aircraft manufacture. His efforts are aimed toward getting aircraft manufacturers to release some of their workers who live near West Coast aluminum plants.

Still another study is being made by Andrew Biemeiller, special assistant to Joseph D. Keenan, WPB vice chairman for labor. He's seeking a solution to community facilities difficulties.

In a direct attack on the manpower problem, a series of meetings are scheduled for Washington with the object of setting up a program which will produce 300,000 new aircraft workers by the end of the year. Charles E. Wilson is determined to meet increasing production schedules and in announcing the meetings said the Aircraft Production Board will take every step possible to assure the aircraft industry an adequate number of workers and to aid the industry in meeting other obstacles to peak production.

Despite usual production troubles, the production schedules hang on the manpower issue, and Wilson emphasized that the government is ready to take whatever steps are necessary to solve the problem, which involves recruiting new workers and holding present ones on their jobs; he said the complete cooperation of Selective Service is assured in this connection.

The Bell Aircraft plant at Buffalo has been chosen for a survey to be conducted by WPB on labor turnover from an inplant angle.

The survey, under the direction of WPB Vice-Chairman Joseph D. Keenan, was decided upon as the result of requests from industry. Some executives expressed the opinion that they were not getting the real story on turnover from employees and believed that an outside agency, working from the employees' point of view, might be able to get a more accurate picture.

Grumman Aircraft has announced its production for the Navy now exceeds $1,000,000 a day. Having met and exceeded Navy production schedules, the company will continue to expand its output toward a peak sometime next winter. While not disclosing 1943 deliveries of the new F6F Hellcat Navy fighter, officials said Avenger torpedo planes and other aircraft probably will top $300,000,000, more than double the $143,000,000 recorded for 1942.

The Hellcat, though still hush-hush among Navy officials, is reputedly another design triumph for Grumman. Most airmen who have seen the ship are highly enthusiastic.

The Army plans soon to return to the commercial airlines the 165 planes it borrowed from them, June, 1942. During the ensuing twelve months, after having had its number of commercial ships in operation reduced by one-half, airlines handled 80 percent more airmail. As a result, about 20 percent of air mail was delayed.

Return of the borrowed planes is expected to provide an important measure of relief. Both the Army and the Postoffice Department are understood to be seeking other ways of eliminating delays which sometimes results from sending air mail at least part way by train. One Army suggestion is that air mail service be dropped on short runs having parallel fast train service.

Lucky 13th—The addition to Consolidated Vultee Liberators of an Emersin electric nose turret brings to 13 the number of .50 cal. machine guns defending the plane in combat. Three other turrets are located in the tail, belly and on top of the fuselage. Note the B-24 in the background with the former plexiglas nose installation. Installations in the four-engined heavy bombers are being made at Convair's Fort Worth plant

Stamping Producers Use Skills to Conserve Critical Materials

NEW YORK—Stampings are rapidly assuming an important position in munitions manufacturing. During the period of converting industry to war work, it was commonly said that the power press would see little service until peace returned. But proponents of that idea did not reckon with the foresight of Army Ordnance and other military agencies, nor with the initiative of individual suppliers. Currently more than 100 firms in the stamping business are handling a volume of work well above their peacetime levels, and some are doing a dozen times as much.

Early in the war high officers in the Army Ordnance department began to think of redesigning certain items for production from stampings or composite assemblies, as a means of conserving material, labor and machine hours. Ordnance materiel had been designed in peacetime, it made lavish use of bar stock, forgings and castings, and many parts had from 30-70 percent of the original metal whittled away in machining processes.

About the same time, energetic operators of pressed-steel plants got their hands on typical parts, redesigned them for stampings, peddled their ideas in Washington. These efforts got some plants into full-blast operation on war contracts by last fall.

The conversion program went ahead rapidly after a special Suggestion and Conversion Section was set up by Army Ordnance last summer, with district ordnance offices instructed to work closely with contractors, and screen out ideas for transmittal to Washington. As of June this year 2,708 suggestions were reviewed at headquarters.

Translated into terms of materials saved by these suggestions, including those made by pressed-metal manufacturers, the score at mid-August was this: enough aluminum to build 25,500 fighter planes, enough copper for three billion rounds of 50-cal. aircraft ammunition, enough steel for 31,000 tank cars. Prodigious amounts of other materials were saved: namely, 64 million lb. of nickel, 17½ million lb. of chromium.

While this was going on, George E. Whitlock, president of Mullins Mfg. Co., was agitating for formation of the Pressed Metal Institute, and this was realized in May of this year. Now PMI has 100 member firms. Potential membership is figured at 500 concerns doing either a jobbing business, or also making stampings for their own end products. Associate memberships have been given metals manufacturers, tool and die makers and press builders to attain a community of interest and understanding of common problems.

Present objective of PMI is to correlate experience of pressed-metal fabricators on the war job, act as a clearing house for sub-contract wants, disseminate data on new methods and processes. Yet PMI is telling the story of what its member firms have done on war work to save materials and labor, use less critical materials.

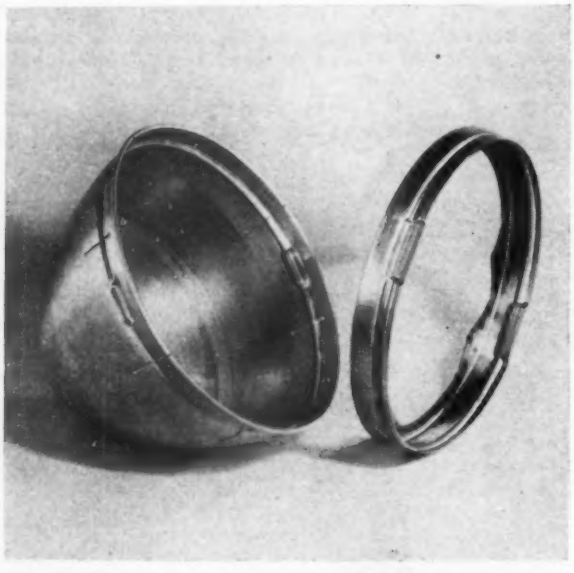
One example cited is that of an aluminum propeller nose. Original specification called for machining a forging. A press plant did the "impossible," draws the propeller nose from a blank. The finished part costs $10 less than the original, or a 40 percent saving.

Another firm has specialized on close-tolerance work, is turning out small pinions with a run-out of only 0.002 in. and with the spline hole able to engage the mating spline shaft at any position.

A third firm is doing considerable work in combining pressings with other simple steel shapes by brazing. This company brazes a steel tube to a collar to form the exploder for a British 75 HE shell, and accomplishes a weight saving of 87½ percent as compared to machining from bar stock. For a primer, 40 percent of the weight is saved, and contract calls for 23 million pieces.

Achievements in redesigning munitions components have won for PMI members a number of Ordnance "distinguished service" awards. Latest on the list is C. W. Hannon, president of the Murray Ohio Mfg. Co., for his work on a redesigned stamped trigger housing for the 30-cal. carbine. Involving tolerances of 0.002-0.003 in., the new assembly on one order alone saved 720,000 machine hours and $5,100,000. The assembly consists of 13 stampings, welded and furnace brazed.

Pressed metal means steel principally, for if all the planned capacity for aluminum production were to be applied to substitutions for steel in post-war products, the displacement of steel would amount to less than 5 percent of total output. Even so, PMI is forming committees to plan post-war strategy, to tell the story how pressed metal saves material and cost, to meet the competition of plastics, glass, new war-born materials.



Virtually no machining is required on this stamped aluminum propeller nose that replaces a machined forging, costs $10 less per unit. Other aircraft-part conversions relate principally to the substitution of steel stampings for aluminum castings.

Worcester Pressed Steel Co.

New Arrangements Announced

DETROIT—As stated recently in AMERICAN MACHINIST, the arrangement under which Sheffield Corporation, Dayton, manufactured machine tools for Wickman Corporation, 15533 Woodrow Wilson Ave., here, has been terminated.

The Wickman Corporation has made new manufacturing arrangements and continues to market in the United States the Wickman high-precision Swiss-type automatics in two sizes and the Wickman profile grinders. Distribution of these machines in Canada is handled by A. C. Wickman (Canada) Ltd., Toronto.

THEIR WAR EFFORT CONTINUES

DETROIT—Disabled war veterans, now taking jobs in automotive plants, are proving a valuable source of new workers, the Automotive Council for War Production has announced. Companies with experience in hiring service men from this war are highly pleased with the work they perform.

Not treated as objects of pity, these men are assigned to real jobs on the production line.

New England War Production High, Without Much New Facilities; no Rush to War Jobs

BOSTON—New England is in the war with all it has. And it is in the unique position of having been able to increase its manufacturing output some 80 percent and absorb about eleven billion dollars worth of war contracts with comparatively little new plant construction or Federal aid. It is doing a good job of speeding up and increasing efficiency. It is doing this in a way that produces the goods, leaves the plants in shape to resume normal lines without serious dislocations and in better shape than ever.

Shifts Were Easy

Changes in the type of product required of a plant are taking place but these cutbacks have not created any marked gaps in operation because it has been comparatively easy to change items of production without elaborate re-tooling. Manufacturers of textile machinery were quickly thrown into the building of machine tools. When distressed machine tool builders were again able to handle their orders the textile machinery plants were promptly swung into the production of torpedoes, armament or other end goods. Builders of grinding machinery contribute by producing ship's turbines.

This increase in productivity was brought about not only by utilizing idle plant capacity but by replacing worn and obsolete equipment. Whereas before the war, seventy percent of the machine tools in use were more than three years old, today only thirty percent have that age. Running night and day these machines will be worn out by the end of the war.

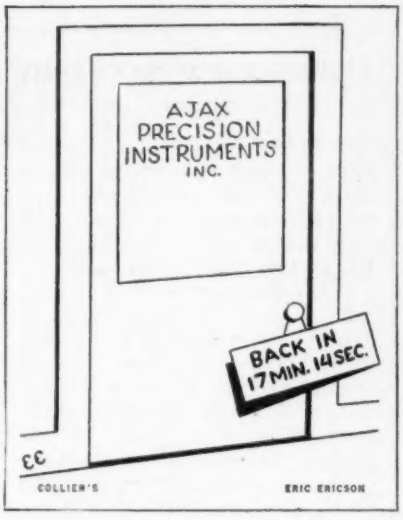
Before the war, New England industry produced about 8 percent of the country's goods. It has absorbed about 10 percent of the nation's war contracts—indicating that it is doing its share. Contributing to this aggregate are a great many plants having less than 500 employees each. To keep even the smallest of these filled with essential work an outstanding accomplishment is being performed by Richard C. Cooke, Regional Director of the Smaller Plants Corporation of the War Production Board. Since August 1 more than 800 such plants in the metal working field have been given contracts and priorities on materials amounting to over $5,000,000. These were for general machine work, welding, forgings, and stampings.

Turn to Essential Home Goods

In addition to strictly war goods the output of these smaller plants is being turned to consumer goods essential to the war. This is in conjunction with the program of the Office of Civilian Supply. There are now some 88 items on the war-worker-consumer list including such articles as ice boxes for war-workers' homes, alarm clocks, typewriters, wheelbarrows and other implements and tools that can be made largely of wood and other non-strategic materials. These are designated as "Victory Models." They are helping to utilize every ounce of New England industrial energy.

Manpower is Acute

In the major industries the most acute problem is still manpower shortage. Manufacturers in the metal working industries are hard put to make promised deliveries on this account. There has been a slight absenteeism due to some misunderstanding of the withholding tax. Workers have refused to work overtime when in so doing their earnings brought them into a larger deduction. By a slow process of education this is being overcome. In plants having the production incentive bonus system in force in only certain departments, some difficulty is met with workers who do not enjoy the opportunity of earning the bonus. There has been a tendency to slow down to be brought into the premium category.



Order Hasn't Brought Rush

In shipbuilding in this area 20,000 workers are needed. The new rules for inducting men under the Selective Service System announced August 14 and commonly dubbed the "work or fight" order has not resulted in any mad scramble for essential jobs. The Greater Boston office of the U. S. Employment Service is appealing to men not within the list of critical occupations to register now rather than wait until October when they will lose all claim to deferment.

Existing labor conditions in various localites are taken into consideration in the placing of war contracts. In this connection, Regional Director Joseph A. Smith of the War Manpower Commission has issued a bulletin on the adequacy of labor supply in important labor centers. He has designated four areas. The first in which the labor shortage is most acute consists of Bridgeport, Hartford, New Britain-Bristol and Waterbury in Connecticut; Portland, Maine; New Bedford, Mass. The second group where conditions are slightly better consists of Meriden, Middletown, New Haven, New London-Groton and Stamford, Conn.; Bath, Me., Attleboro, Springfield-Holyoke, Northampton, Mass.; Claremont and Portsmouth, N. H.; Newport, Providence-Pawtucket-Woonsocket, R. I.; Springfield, Vt. The third group showing further improvement includes Norwalk and Norwich, Conn.; Lewiston, Me.; Boston-Quincy-Hingham, Brockton, Fall River, Fitchburg, Greenfield, North Adams, Salem-Lynn, Taunton and Worcester, Mass.; Nashua, N. H. The fourth group comprises Danbury and Torrington, Conn.; Bangor, Me.; Haverhill, Lowell, Lawrence and Pittsfield, Mass.; Concord and Manchester, N. H., and Burlington, Vt.

Tension Tester—Westinghouse technicians at East Pittsburgh recently converted a store-type scale into an accurate device for testing small springs. It will accommodate tension springs with a minimum length of 9/16 in. and compression springs with a maximum length of 3 in. Working range is 30 lbs. A dial gage measures tension or compression and a micrometer is attached to the moving head for testing springs at fixed lengths

ANNOUNCE NEW HEAVY ARMY TRUCK

DETROIT—Information has just been released concerning certain details of the Army's new six-wheel-drive cargo and troop carrier, now in volume production at the Dodge Army Truck plant.

It is capable of carrying 16 men, with supplies. It can also mount larger cannon than the four-wheel-drive. Despite its larger size and greater power, its parts are approximately 96 percent interchangeable with those of the smaller four-wheel-drive trucks.

So well protected are its vital parts, that the vehicle can go through water and mud 3 ft. deep without drowning out its engine, and with little apparent effort. Because of its concentric-bowl carburetor it can climb or descend steep grades with the same engine efficiency as on level ground. And even when fully loaded, it can climb grades as steep as 62 percent The six-wheel carrier has undergone rigid tests at proving grounds and Army camps.

NAMES in the NEWS

K. R. BEARDSLEE

K. R. Beardslee, general sales manager of Carboloy Co., Detroit, makers of cemented carbide tools, dies, wheel dressers and electronic brazing equipment, has been appointed vice president in charge of sales. Mr. Beardslee has been associated with the company for the past 13 years, first in the Newark branch office and later as district manager in the Pittsburgh office.

R. E. Brown has been transferred from the position of works manager at the Miami, Fla., division of Consolidated Vultee Aircraft Corp. to works manager of the new Allentown, Pa. division. He will be replaced at Miami by E. N. Laurance, factory superintendent, who becomes acting works manager.

S. R. Kallenbaugh has been named West Coast district manager of the Steel & Tube Div., Timken Roller Bearing Co., with headquarters at 1526 S. Olive St., Los Angeles. He has been serving as metallurgical service representative for the company in Cleveland and Detroit.

George D. Shaeffer, previously chief engineer of the road machinery division of Gar Wood Industries, Inc., Detroit, producers of automatic heating and air conditioning systems, has become chief engineer of the company's engineering departments.

Ralph C. Stuart has been named manager of Westinghouse Electric & Mfg. Co., Lamp Div., in Bloomfield, N. J. He will have charge of all activities of this division, including sales, illumination engineering, district office activities, as well as manufacturing and engineering in the division's five plants in New Jersey and West Virginia. Mr. Stuart was formerly connected with Canadian Westinghouse Co. for 25 years, and joined the Bloomfield plant in 1941.

Leroy K. Behr has been appointed district manager in Philadelphia for the Abrasive Div. of Norton Co., Worcester, Mass., makers of grinding wheels, abrasives, grinding and lapping machinery. Mr. Behr has been associated with Norton for 16 years, first in the sales engineering department at Worcester and then as abrasive engineer in England. For the past three years he has been located in the Boston headquarters.

C. Hart Miller, vice president of Republic Aviation Corp., Farmingdale, N. Y., has become divisional manager of the Farmingdale plant. He joined Republic 3 years ago as assistant director of the export department.

A. E. Armstrong, president of Wells Mfg. Co., Three Rivers, Mich., maker of metal bandsaws, has become general manager of the organization.

BUSINESS ITEMS

American Brake Shoe Co. has acquired the Electro Alloys Co. of Elyria, Ohio. Walter C. Hoffman, manager of the brake shoe company's American manganese steel division, becomes president of Electro Alloys. The plant will be operated as a subsidiary of American Brake Shoe Co.

Moore Special Tool Co., Bridgeport, Conn., has taken over the distribution of the Lacey portable die-set machine for tool and press rooms.

Stone Tool Co. has been established in Los Angeles by Clifford C. Stone, formerly vice president and general manager of Empire Tool Co., Detroit, makers of Luers blades and holders. Mr. Stone will represent the Empire Tool Co. as exclusive dsitributor in the territory west of the Mississippi and the southeastern states east of the Mississippi.

Coulter-Sibbett Steel Co. has been appointed Arizona and Southern Calif. distributor of Timken graphitic steels, produced by Timken Roller Bearing Co., Steel & Tube Div., Canton, Ohio.

OBITUARIES

Ewald H. Schniewind, 56, president and director of Powder Metals & Alloys, Inc., New York City, died on Nantucket Island, Mass., where he had been vacationing. For many years Mr. Schniewind had been connected with the silk industry as senior vice president of the Susquehanna Silk Mills, specializing in the manufacture of throwing machinery and automatic looms. In 1937 he became associated with the metal industry.

John Winters Upp, 75, formerly manager of General Electric Co., switchgear division, passed away in Ardmore, Pa., of a heart attack. He had been connected with the company since 1901, and in 1907 he was appointed manager of the switchgear division with headquarters in Schenectady. His control extended over switchgear manufacturing at Baltimore and Philadelphia as well as the Schenectady division. Mr. Upp retired from G. E. in 1933.

William D. Thomas, 55, steel specialist, died at his summer residence in Hewlett Harbor, Long Island. He was owner of W. D. Thomas Co. and president of American Defibrator, Inc. of New York. He was also affiliated with the Stanley Works, New Britain, Conn., producers of pressed metal, hot and cold strip steel, and steel strappings.

MEETINGS

American Institute of Electrical Engineers. National Technical meeting. Hotel Utah, Salt Lake City, Utah. Sept. 2-4.

Society of Automotive Engineers. Aircraft Engineering & Production meeting. Biltmore Hotel, Los Angeles, Calif. Sept. 30-Oct. 2.

National Safety Congress. Annual meeting. Morrison, La Salle and Sherman Hotels, Chicago, Ill. Oct. 5-7.

American Welding Society. Annual meeting. Hotel Morrison, Chicago, Ill. Oct. 18-21.

National Metal Congress & Exposition. Annual meeting. Palmer House, Chicago, Ill. Oct. 18-22.

Shop Equipment News

Sheffield Two-Purpose Precision Thread Grinder Produces Single, Multiple, Right or Left Hand Threads

Either the conventional single-ribbed wheel or the multi-ribbed wheel may be employed on the No. 100 series precision thread grinder produced by Sheffield Corp., Dayton 1, Ohio, for producing single or multiple right or left hand threads with any pitch up to 60 threads per inch. The machine will hold work of 12 in. between centers, and will grind a maximum thread length of 8 in. It will accommodate work of a maximum diameter of 7 in., and grind threads to a maximum diameter of 3 in. Any type of thread can be ground with the wheel properly shaped. The grinder occupies a floor space approximately 60×70 in. and weighs 4,800 lb.

Traverse grinding or plunge cutting may be employed. In the plunge cutting operation a multi-ribbed wheel sufficiently wide to equal the thread length is fed into the full depth of the thread, and the threaded increment is formed in one pass, with the stock making 1 1/3 to 1½ turns. The machine will grind in one pass two, three or four multiple start threads in most cases.

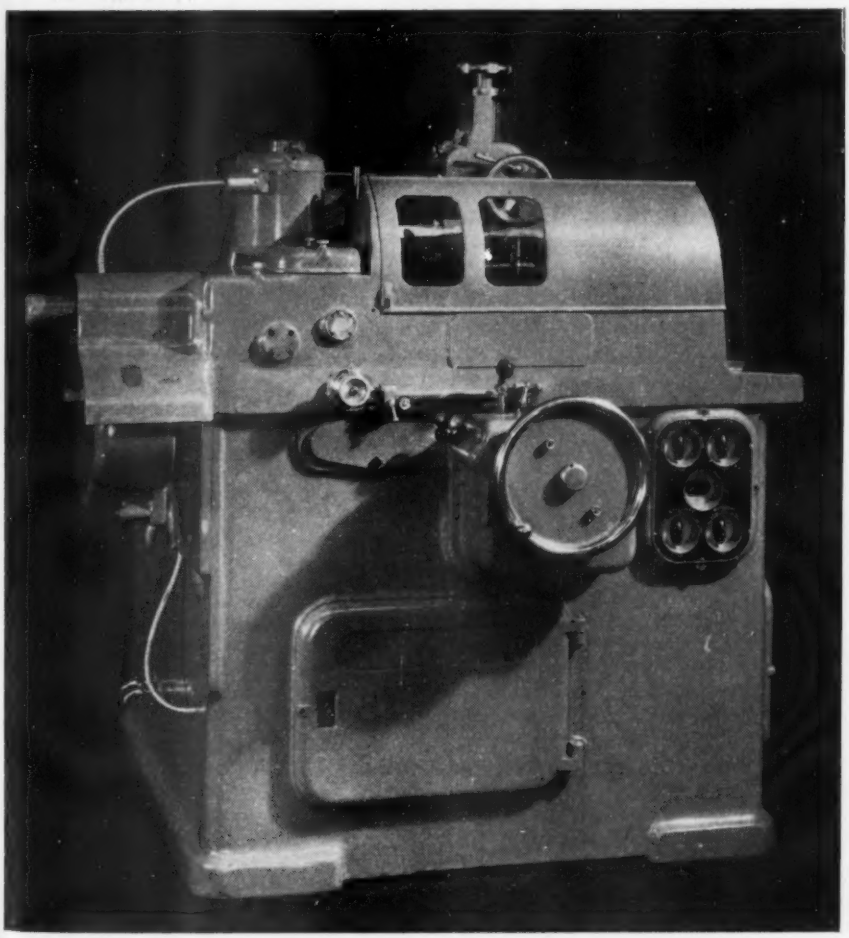
A feature of this machine is the multi-ribbed wheel crusher which is forced into the slowly rotating wheel accurately to form the wheel ribs. Another is an oil pressure switch which prevents the wheel motor from starting until the oil pump has built up pressure to a predetermined point for continuous operation.

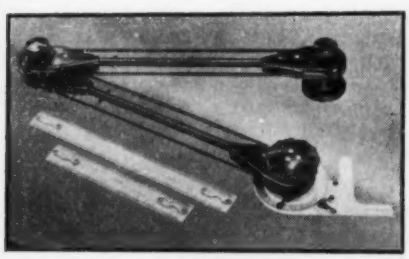
A vertical motor mounted on the work head rotates the work and drives the table through reduction gearing. Seven cutting speeds are provided in a range from 0.83 to 7.5 r.p.m. The specific speed is selected with reference to the diameter of the thread being ground. The work head reverses at a return speed of 200 r.p.m., regardless of the cutting speed. On models having automatic control the work is automatically returned to the starting position and the machine stopped.

The table is driven by the work head motor through the headstock and a gear box to a longitudinal leadscrew. When left hand threads are cut an extra chain gear stud is used to reverse the table travel. A graduated handwheel enables adjustments of 0.000050, which is especially advantageous for locating threads previously cut.

The adjustable tailstock is mounted on V and flat ways on the table to which it is clamped by T-bolts when in the operating position. The tailstock may be adjusted laterally for grinding work with a limited amount of taper, and to facilitate the setting for parallelism. The tailstock barrel carries a Morse taper center.

The grinding wheel head is a self-contained unit with a statically and dynamically balanced motor fitted with special mountings to prevent vibration or undue tension on the spindle. The wheel head is carried on a slide unit incorporating the V and roller principle.





Vemco Junior Drafting Device Has Full Circle Setting

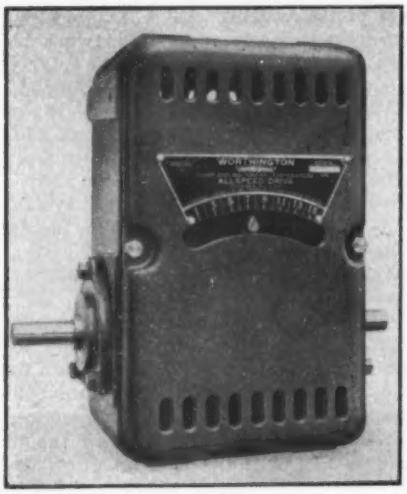
The Vemco Junior drafter offered by V & E Manufacturing Co., Pasadena, Calif., is made of plastic. It has a full circle base-line setting and pre-lubricated, double-sealed ball bearings and inclosed pulleys. Disk brakes at anchor and elbow allow the drafter to be used on steeply inclined boards. The central skid button is also of plastic. This drafter weighs 3 lb.

The equipment is flexible so that the scales lie flat. Moreover, the head can be readily raised high off the board. A band-tightening device is used on this model.

Lightweight aluminum scales are available in 8- and 12-in. lengths, and fit into slotted chucks in the scale holder. The protractor is 3¾ in. in diameter and is graduated in degrees with figures by quadrants.

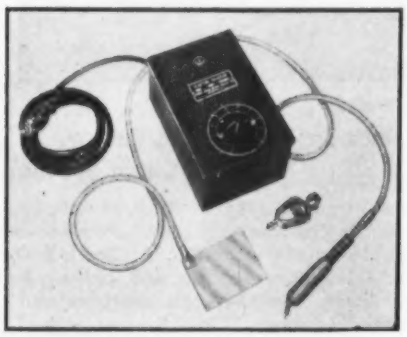
Worthington Allspeed Drive Is Adaptable to Any Machine

Worthington Pump & Machinery Corp., Harrison, N. J., is producing an Allspeed drive for stepless speed control of machines. The Model A unit is built in a 16:1 ratio; that is, to provide speeds from one-eighth of motor



speed to twice motor speed. It may be driven by a ¼ to ¾ hp. motor. Other sizes up to 10 hp. are in preparation.

The Allspeed drive consists of a pair of belts running over variable-pitch sheaves, or pulleys, which are adjusted for the desired speed by a single lever. The output shaft can be placed at either the left or right hand side of the housing. A standard 1,725 or 1,800 r.p.m. motor can be connected direct or by V-belt to the Allspeed drive. Over-all dimensions of the Model A are 12¼ in. wide over the driving and driven shafts by 12 7/8 in. high.



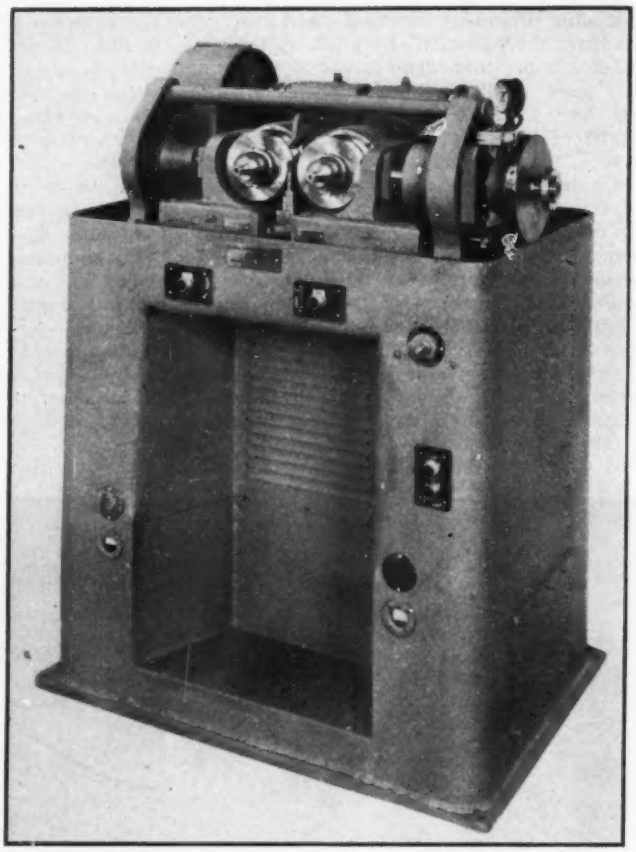
Preis Electrical Marker Used for Soft or Hard Steel

A freehand electrical marker is offered by H. P. Preis Engraving Machine Co., 157 Summit St., Newark, N. J., for placing numbers, symbols and identifications on soft or hardened steel, alloy steels or other ferrous alloys, wrought iron and cast iron. The equipment may also be used as an attachment to the Preis Panto electrical marker for pantographic reproduction. The unit is available for either 115 or 230 volts, a.c., 25, 50 or 60 cycles.

This marker consists of a special transformer with ten voltage stages controlled by a rotary switch, a hand-held marking pencil, a ground plate for use with small work and a ground clamp for large work. The voltage selection provides markings to any desired depth. A pilot light signals when the current is on. The work is not magnetized by the use of this marker.

The marking point is made of heat-resisting alloy and is threaded into the holder at an angle so that it stands vertical to the work when the holder is placed in a normal writing position. The holder has a heavy cork insulation and hollow construction which permits a constant flow of air through the entire length of its Bakelite sleeve. The use of this device is said to eliminate the necessity for stamping parts before heat-treating.

Watson-Flagg Precision Thread Rolling Machine Cold Forms External Threads Up to 2¾ In. Long



External threads from 3/16 to 2½ in. in diameter and up to 2¾ in. long can be rolled by the cold forming process with the precision thread rolling machine offered by the Watson-Flagg Machine Co., Paterson, N. J. and sold by W. A. Schuyler, 250 West 57th St., New York 19, N. Y. The machine produces Class 4 Fit required for threads on bolts, studs, screws and the like, made of high tensile strength steels. Accurate threads of all standards can be rolled also on light metals, hollow bodies, tubes, shafts or spindles. The bearing block for the roll on the left can be displaced angularly so that tapered threads can be rolled. The capacity of this machine depends upon the metal to be threaded. It will handle ⅛ to 1 in. diameter high tensile strength steels, and up to 4½ in. materials of lower strengths. Threads can be rolled on parts made of light metals or other non-ferrous metals.

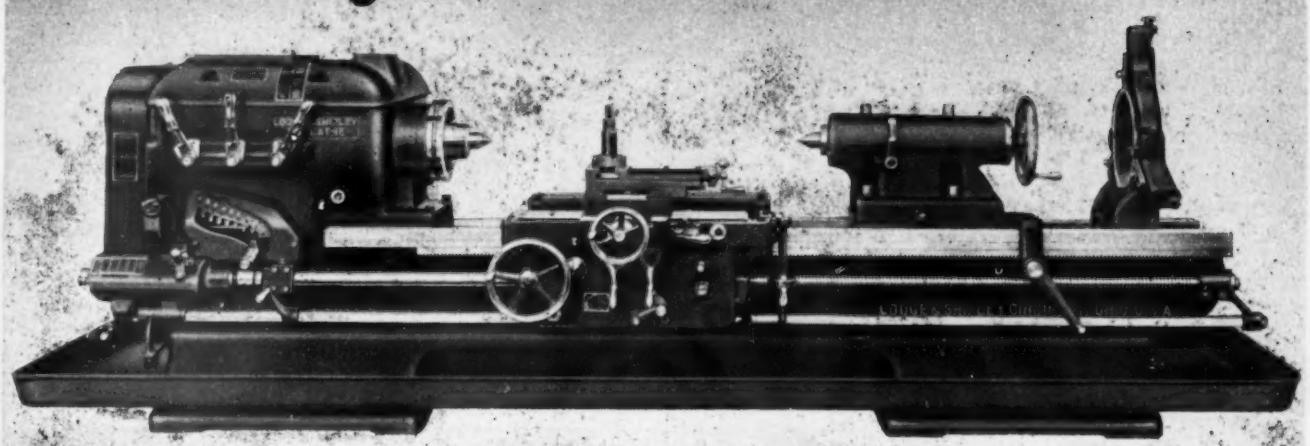
Two steel rolls of large diameter, having on their faces negative multiple threads of the same profile, pitch and helix angle as the thread to be rolled, are pressed with gradually increasing hydraulic pressure into the work piece or blank. All the threads are rolled simultaneously. The blank, which rests on a blade between the rotating rolls, turns on its axis but does not move axially.

When the required pitch diameter is reached, the automatic sizing control releases the hydraulic pressure on the rolls and the carriage-mounted roll automatically returns to its starting position. This control is built into the machine and is set by a micrometer adjustment.

The long rolling course provided in this machine makes it possible easily to adjust the rolling pressure and the speed of the rolls to suit the metal and the pitch and diameter of the thread. The sustained rolling pressure condenses the metal forming the thread and produces one that is strong and at the same time burnished to a mirror-like polish.

The thread forming rolls are mounted on heavy shafts running on roller bearings. The drive is by a 5 hp. motor, V-belts and a double set of worm gears. A separate motor drives the pressure oil pump. All parts for the drive, including the coolant pump, tanks and filters are in the machine base and fully inclosed.

TOMORROW'S LATHE ... TODAY!



INCORPORATING every feature necessary for easy and profitable operation, the Lodge & Shipley 25" and 27" Selective Head Lathes are powerful, heavy duty machines which reflect in every detail the experience gained over many years of specialized manufacture of lathes. Whether the job be one requiring unusually close limits of accuracy or one where speedy removal of metal is necessary by heavy hogging cuts, these lathes provide an ease of operation which permits the operator to do far more and better work with less expenditure of effort.

Write for detailed information.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

Ever-Drest Compound Conserves Grinding Wheels

Wolfe-Kote Co., Sheboygan, Wis., is offering Ever-Drest, a compound that is added to the grinding coolant at the rate of ½ lb. to each 5 gal. of water for wet grinding operations. The material is said to lower the surface tension of the coolant, to keep the wheel open and to add to the grinding wheel life. Ever-Drest is suited for both organic and vitrified wheels.

Packer-Matic Grinding Machine Will Deburr Special Shapes

For deburring operations on studs, screws and various special shapes, Packer Machine Co., Meriden, Conn., has built the Packer-Matic No. 7 continuous rotary grinding machine. It occupies a floor space 28×47 in., and height of table from the floor is 36 in. and its diameter is 25½ in. The main motor drive is ½ hp., with a 1 hp. motor, or larger as required, for driving the wheels. A second head can be attached for multiple operations.

The fixtures or holding devices are mounted on the table which runs on a ball-bearing spindle designed for accessibility in making changes. Attachments are provided for automatic discharge of the finished work and hopper feeds can be used wherever practical. The base is fully inclosed and includes a dust-tight cabinet as an integral part for all electrical controls. The wheels may be mounted in a vertical or horizontal position as required.

G.E. Synchronous Motor Made in Hollow Shaft Type

For pumping applications where a large volume of fluid is handled, General Electric Co., Schenectady, N. Y., has developed a vertical high speed, hollow shaft synchronous motor with ratings from 100 to 1,000 hp., and in speeds from 514 to 1,800 r.p.m. The motor is streamlined throughout and has a drip-proof inclosure for protection. The top cover of the motor is removable to permit adjustment of the pump shaft. Also, easy access is provided by unlatching a flush-mounted steel plate to reach the brushes and the collector rings.

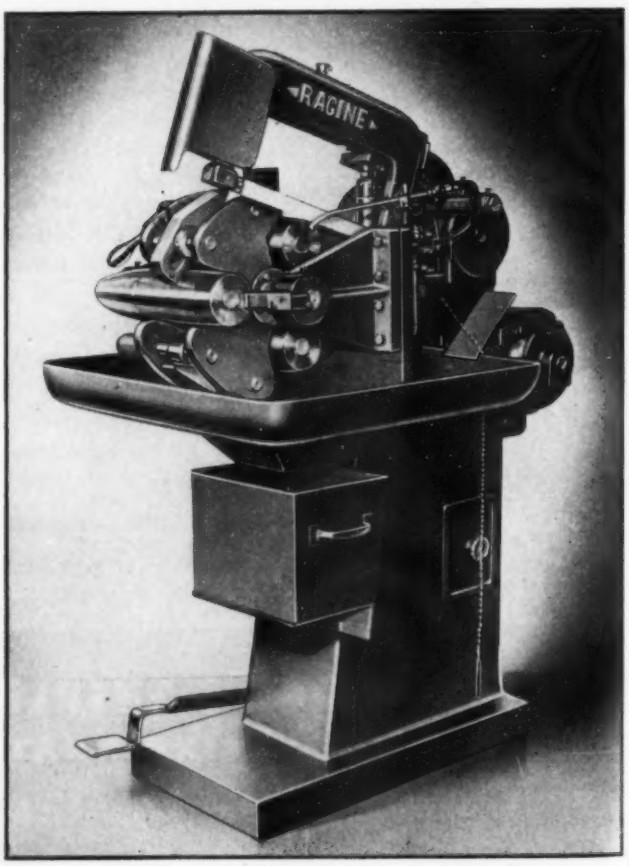
It is equipped with non-reverse ratchets, ball upper thrust and guide bearing, and sleeve-type lower guide bearing. The non-reverse ratchet prevents reversal of the pump rotation at shutdown or on starting. The unit is available also in solid shaft construction.

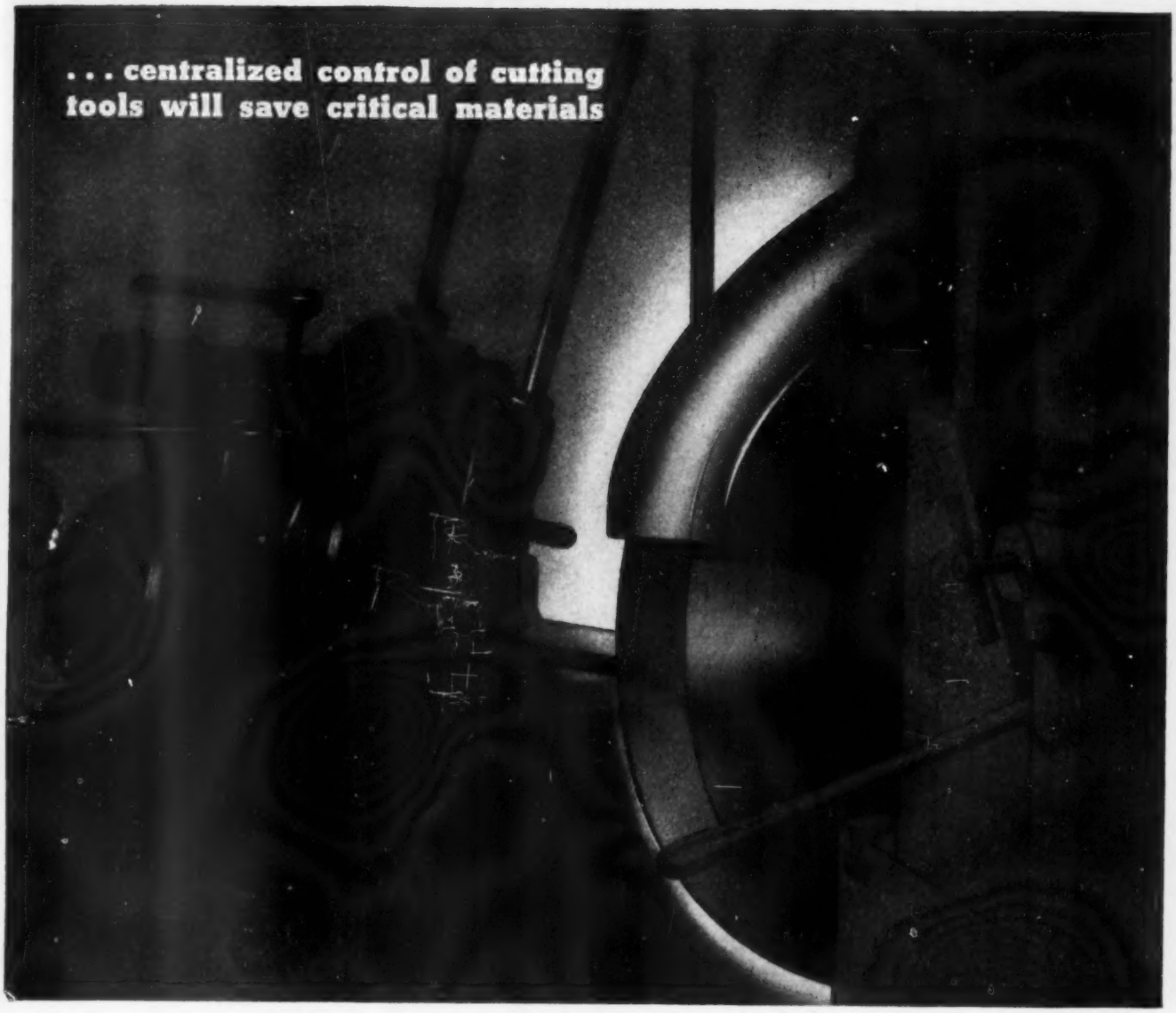
Racine Metal Cutting Saw Cuts Light and Heavy Material

Armament work of several types, such as shell cutting, rifle cutting, cutting of bomb-ends, cannon and gun barrel forgings can be handled on the metal cutting saw made by Racine Tool & Machine Co., Racine, Wis. It is a hydraulically fed and controlled unit. The complete line ranges in capacities from 6×6 to 20×20 in.

With single lever control, the saw has a complete range of feeds for cutting the full run of metals from thin-walled tubing, aluminum and soft steels through hard steels, special alloy and stainless steels, die blocks.

The flexibility of this saw permits the use of many different types of jigs and fixtures for production of unusual metal cutting operations on war material, such as removal of the shell nose or nub after the lathe operation has been performed and trimming the forging flash from several shells at a time with one fixture.





Information supplied by an Industrial Publication

The unnecessarily high casualty rate of single point cutting tools is a phase of speeding up production that needs close attention from management.

One remedy that offers great possibilities is the establishment of a system of centralized tool control.

Such a system would have the obvious advantage of coordinating three most important factors—design, operation and maintenance of cutting tools.

To be effective, design should be based on a knowledge of actual operating requirements, including material being cut and the machine on which the tool is to be used.

Speeds and feeds should be selected from the point of view of economical tool life instead of rate setting. Then operators should be prevented from running tools to destruction, thereby eliminating the necessity for trying to salvage tools that are worn beyond all semblance of their original form.

All worn tools should be redressed in the tool crib by machine according to the drawing. Operators should not be allowed to redress tools by hand to the angles they assume the tool originally had.

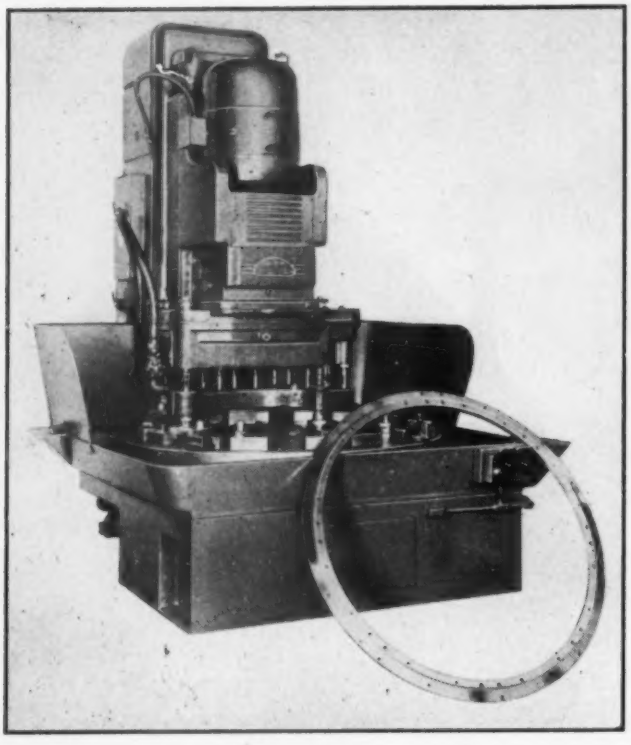
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

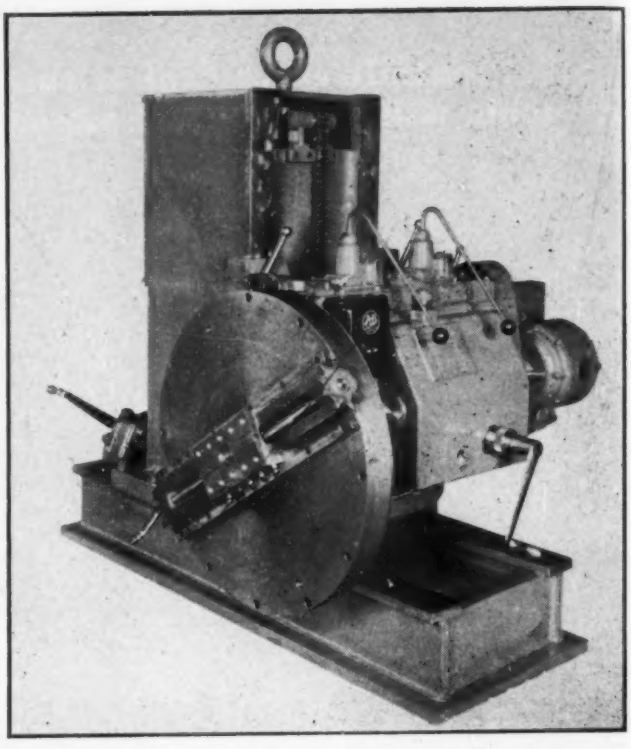
ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company
500 Fifth Avenue • New York City

MOLY





Snyder Drill Adapted to Tank-Destroyer Turret Rings

The standard 20 V 16 drilling, milling and boring machine, made by Snyder Tool & Engineering Co., 3400 East Lafayette St., Detroit, Mich., has been adapted for drilling 56 holes in a large diameter locating ring used on a tank destroyer. For this operation, the machine is equipped with a 14 spindle multiple head which completes the holes after four indexes.

The table is 60 in. in diameter, is manually operated and carries the locating and clamping details. Because of the large size of the table, a large sub-base is used which also serves as a chip trough. The machine is built in two sizes, the larger for drilling holes up to 5 in., the smaller for holes up to 4 in. or equivalent.

This machine can be used for single as well as multiple spindle work and its features include adjustable hydraulic feed with rapid advance and return under preset remote controls, adjustable dogs for controlling cycles and readily accessible control buttons. Both the machine and the large index table are adapted to a wide variety of work, and since only the equipment is special it can be readily retooled.

Boice-Crane Spindle Sander Grinds Aluminum and Iron

An oscillating spindle sander with a small diameter abrasive sleeve is offered by Boice-Crane Co., 935 Central Ave., Toledo, Ohio, in sizes of ¾ to 3 in. The machine will sand any degree of bevel up to 6 in. in height and is suitable for grinding aluminum, Masonite, brass, die-castings and sheet iron for templets.

This unit is portable and is vibrationless, has a leakproof and dustproof crankcase. The highly polished 20x20 in. table tilts both ways 45 deg. and is geared for close setting. Two scribed

index lines show the exact positions for beveling, drafting patterns, and for core box work. The sand drum oscillates automatically through a ⅞ in. stroke, 83 complete strokes at 2,500 r.p.m. per min. The ¾ and 2 in. nesting rings are regular equipment on the sander. Bearings are grease packed and sealed.

Gemco Boring, Facing Machine Handles Large Work Pieces

For boring, turning and facing operations on large work pieces where they are too large to be machined on standard equipment, General Engineering and Manufacturing Co., 1523 South Tenth St., St. Louis 4, Mo., can furnish the Gemco boring and facing machine. Although it is made for portable use, it may also serve as a stationary machine.

The machine is mounted on a heavy base and travels by spindle action 36 in. Automatic or crank operated horizontal travel of spindle housing is 19 in., and crank operated vertical travel is 24 in. Seven spindle speeds ranging from 7 to 100 r.p.m., are available, and four horizontal spindle housing feeds ranging from 0.009 to 0.063 in. The diameter of the faceplate of this machine is 33 in. It has a pump-operated gravity oiling system for all bearing surfaces and gears.

Precision Plating Process Bonds Metal to Glass, Plastic

A process of plating plastics, glass or any non-conductor with any of the plating metals has been developed by Precision Paper Tube Co., Special Products Div., 2023 West Charleston St., Chicago 47, Ill. Convex and concave surfaces, convolutions, corners and recesses can be plated as well as flat or round surfaces. The metal plating is permanent and does not crack, chip nor peel off in continued service, it is claimed.

Both rigid and pliable types of plastic tubing and pipe fittings can be plated by this process, which has many other mechanical applications.

On a seamless pipe mill J&L men turn out shatter-proof steel for gas-bottles to protect our fighting men.

COPYRIGHT 1943 — JONES & LAUGHLIN STEEL CORPORATION

FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

INDUSTRIAL TEAMWORK SAVES LIVES ON BATTLE FRONTS

Fearless newspaper writers, risking their lives aboard our naval vessels, bring us living accounts of the heat and fury our sailors face in battle to defeat the enemy. Flying pieces of enemy shells, smashing bomb fragments and piercing bullets from diving planes leave no area, passageway, deck or hold immune from danger. Even the steel gas-bottles of carbon dioxide carried aboard for fire fighting may be hit. These gas-bottles must be shatter-proof, otherwise they themselves would explode like bombs, dealing death and destruction to men and equipment they are designed to protect.

Early in the war the Navy took the problem of developing a shatter-proof gas-bottle to a mid-west manufacturer who in peacetime made creamery equipment. This company in turn came to J&L to develop the special steel needed. From long experience in producing high pressure steel pipe, J&L promptly made experimental tubes of special steel and developed a strength-building heat treating procedure. From these tubes sample bottles were made and tested with 1.1" armor piercing shells at a 50-yard range on an ordnance proving ground. The steel was shatter-proof. The problem was solved. Today J&L's big seamless pipe mills are producing this new tubular stock for making gas-bottles that safeguard the lives of our fighting men.

This is another example of the teamwork between the armed services and industry, with management, scientists and skilled workers doing the miraculous for our armed forces, supplying them with superior equipment that guards their lives and enables them to crush the enemy.

PITTSBURGH WORKS

ARMY E NAVY

ALIQUIPPA WORKS

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL

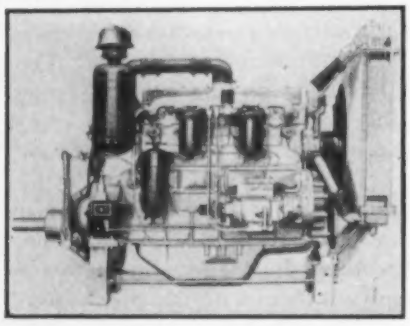
Sheffield Thread Roll Gage Checks Limits in One Operation

The thread roll snap gage is an addition to the line of gages made by Sheffield Corp., Dayton, Ohio. It is a combined "go" and "no go" limit gage for rapidly checking male threads to both maximum and minimum limits in one operation. This snap gage is furnished for American National standard form, coarse and fine series.

The gage consists of a frame similar to a plain snap gage in which two

sets of gaging rolls are mounted, with each roll being free to rotate. One set of rolls represents the "go" limit, and the other the "no go" limit.

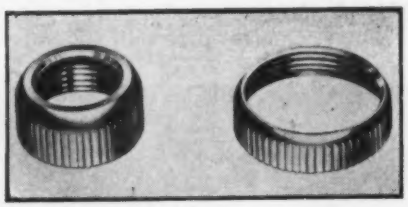
In addition to checking the assembly of male threads with female threads, this gage also assures uniform interchangeability within prescribed limits of the work passed, and reveals specific inaccuracies in the equipment. The rolls can be reground repeatedly.



Chrysler Makes Industrial Six-Cylinder Diesel Engine

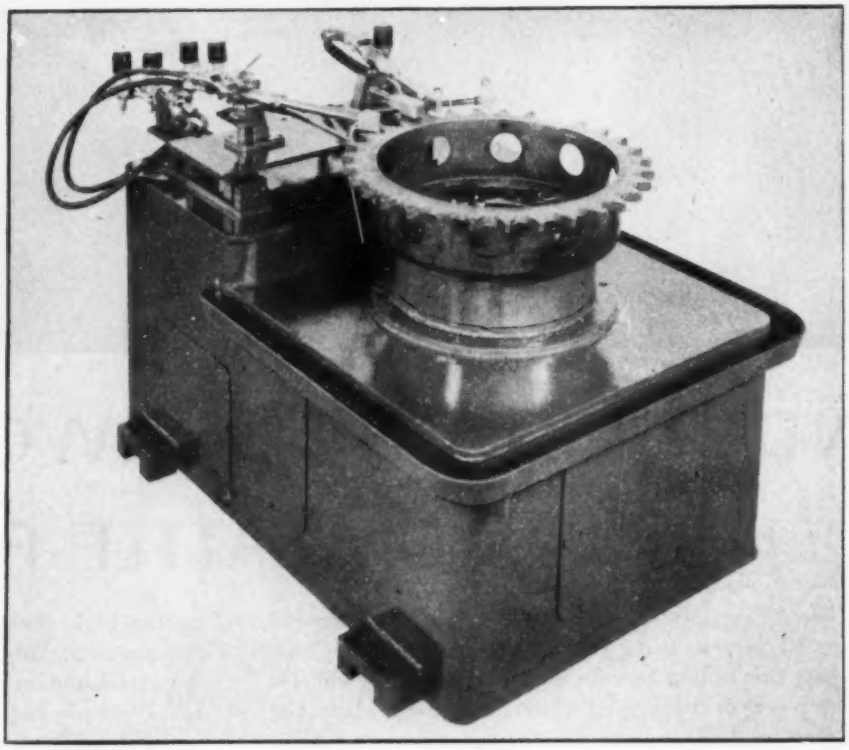
A six-cylinder industrial-type diesel engine has been added to the engine line made by Chrysler Corp., Chrysler Div., Detroit, Mich. This engine has a bore of 3¾ in. and a stroke of 5 in., giving a piston displacement of 331 cu. in. Maximum brake horsepower is 80 at 2,000 r.p.m. Fuel consumption is 0.45 to 0.46 lb. per brake horsepower hour at 1,200 to 1,800 r.p.m. The combustion chamber is of the energy cell type, with a compression ratio of 14.75 to 1. The electrical starting system has a 24-volt capacity with a generator capacity of 5 amp. and 30 volts.

Fuel injection nozzles are the hydraulically actuated type with an orifice of the single, pintle type. The fuel injection pump is a one unit multiple plunger type and gear from the camshaft. Two fuel filters and an air cleaner are supplied. The engine has a speed controlled injection timing advance, speed controlled regulation of maximum delivery and a mechanical top speed governor. Cold room tests have shown that this diesel engine will start without delay in a temperature as low as -40 F.



Rumsen AN 3054 Coupling Nuts Fabricated From Aluminum

The AN 3054 series of coupling nuts produced by Rumsen Co., 8059 Melrose Ave., Los Angeles, Calif., can be supplied in sizes 3, 4, 6, 8, 10, 12 and 16. They have been found particularly useful in the aircraft industry because they are fabricated from aluminum, thus providing a lightweight nut as strong as machined nuts.



Hy-Mac Floor and Bench Model Flame Hardeners Built to Handle Small Parts and Sprockets

The No. 501 bench model Hy-Mac flame hardening machine has been designed by Hydraulic Machinery Co., 12825 Ford Road, Detroit, Mich., for handling small parts. By revising the multiple duty holder and changing the tips on the burners, different shapes and sizes may be hardened. An automatic switch causes the solenoid to retract after the time cycle has elapsed, allowing the part to drop into the quenching medium under the fixture.

The No. 502 is an automatic machine, built especially for hardening sprockets. The indexing-type work holder is located on one side of the table. A movable platform on the other side of the table mounts two water-cooled torches and two quenching nozzles.

As the indexing table is brought into position with the sprocket in place, the pilots ignite the torches at the same time. The torches turn on by automatic operation of electric holding relays and solenoid valves in the supply lines of the torch heads.

When the table moves forward it engages a limit switch which starts an electric timer that determines the period of dwell to bring the teeth up to heat. At the end of the dwell period, the indexing table lowers the sprocket away from the torches and the quenching heads and turns to the next position. When all of the teeth have been hardened, the machine comes to a stop for unloading and loading. This is a hydraulically operated unit.

WAR-TIME SHOP RECIPES

TO CHECK YOUR THREAD HOBS FASTER . . . . . .

No. 6 in a Series

. . . THE NEW "Detroit" HOOK-CHECKER

GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

Designed by Detroit Tap and Tool Company to speed production checking of its own thread milling cutters, this new universal hook-checker is being made available to industry generally.

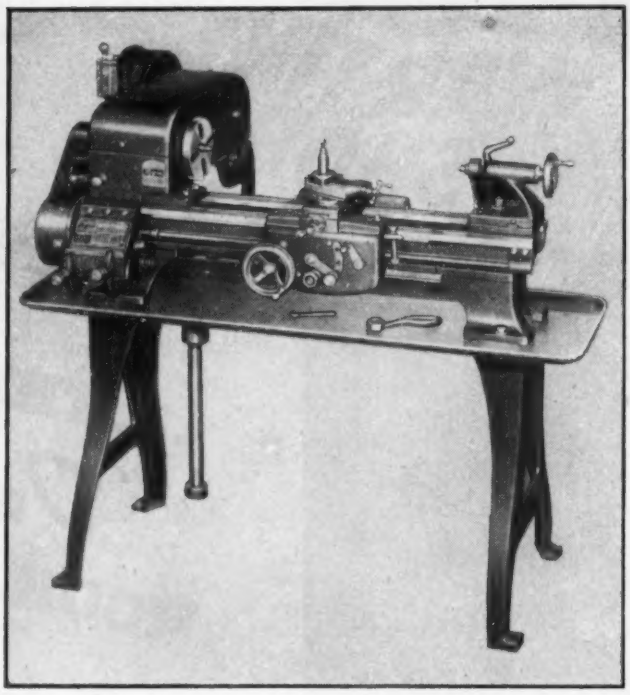
It does not require special setting up for each 'hob'. All you do is slip the cutter between centers, bring a knife edge against the ground side of the sharpened face, by turning a micrometer until you can't see light between the two. Read the 'mike'. A convenient table then tells you whether the cutter is right or how much it is off. A dial tells whether flutes are correctly spaced.

Ask for bulletin No. HC-43 covering this new checker. It also gives useful hints as to sharpening of thread milling cutters.

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT, 11
MICH. U.S.A.



Tocco Junior Induction Heater Adapted to Brazing, Annealing

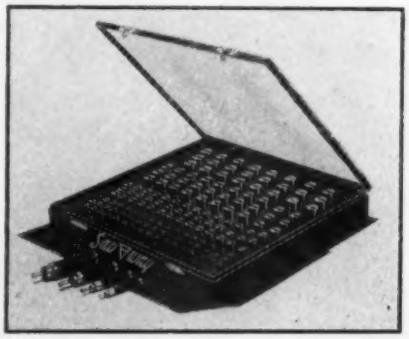
A flexible 15-kw. Tocco Junior induction heating machine, brought out by Ohio Crankshaft Co., Cleveland 1, Ohio, can be adapted to brazing, annealing, heat-treating, heating for forging and surface hardening of small and medium sized parts. It occupies a floor space of 48×32 in. and stands 51 in. high, with the work pan set 35 in. above the floor. Because of its size and moderate weight, the unit can be easily moved and installed, requiring only three connections. Inductors for brazing carbide tips will treat more than one size of tip before a change in inductors is necessary. Any shift is accomplished by unscrewing two connections on the transformer panel.

The machine is equipped with a 20-hp. motor generator set, and can be furnished with either one or two working stations. The coils have been made shock-resistant and water-cooled. Filters set behind the ventilating louvres protect the air-cooled motor compartment from grime and dust. It is said that noise and vibration have been reduced to a minimum in this machine.

Tocco Junior has pre-set automatic controls, quenching auxiliaries, transformers, capacitors, foolproof meters and pushbutton starting and stopping. Timers are placed on the front panel beneath the working pan.

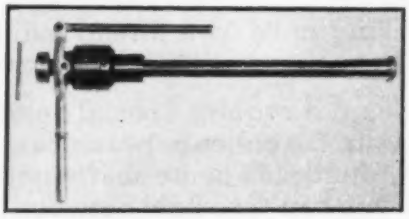
Sav-Way Set of Plug Gages Includes 147 Standard Plugs

A Master Set of standard plug gages for hole inspecting has been developed by Sav-Way Industries, 4873 East Eight Mile Road, Detroit, Mich. The set includes 147 plugs and four handles



which are mounted in a plastic case with a transparent cover.

The plugs are set in increments of 1/64ths, from ¼ to 1 in. There are three plugs of each nominal size, 0.0005 over, standard, and 0.0005 under. These plugs are deep-frozen before finish grinding to relieve internal strain and provide accelerated aging.



Dix-Wilder Collet Closer Fits ¾ In. Spindle Hole

A collet closer can be furnished by Dix Manufacturing Co., 603 East 55 St., Los Angeles 11, Calif. This Dix-Wilder collet closer is made to fit any lathe with ¾-in. spindle hole, and will accommodate 1-A collects.

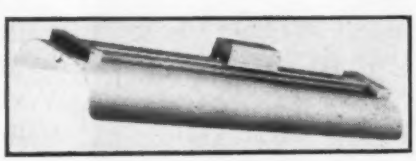
Improvements in this device include positive locking, ball bearing adjustment, fewer parts and no pins, sleeves or liners.

Logan Quick Change Gear Lathe Features an Automatic Apron

The No. 820 quick change gear lathe made by Logan Engineering Co., 4901 Lawrence Ave., Chicago, Ill., has a swing over the bed of 10½ in., a bed length of 43 in., and 24 in. between centers.

The quick change gearbox provides 48 threads and feeds to the carriage in either direction. By adjustment of levers, screw threads from 8 to 224 per in. are available, and by changing the 24-tooth stud gear for the 48-tooth stud gear, additional threads from 4 to 7 per in. are available. Similarly, longitudinal power feeds from 0.0015 to 0.1000 in. per revolution on the spindle may be obtained.

Another feature of this lathe is the automatic apron which operates from a spline in the leadscrew through a worm drive and friction clutch for both longitudinal and cross feeds. For cutting threads, an additional longitudinal drive operates from half nuts on the leadscrew. A safety feature makes it impossible to engage both drives at the same time.

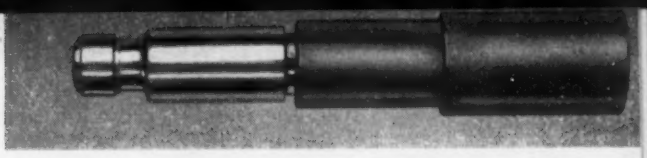


Miller Lighting System Equipped With Lamp Lock

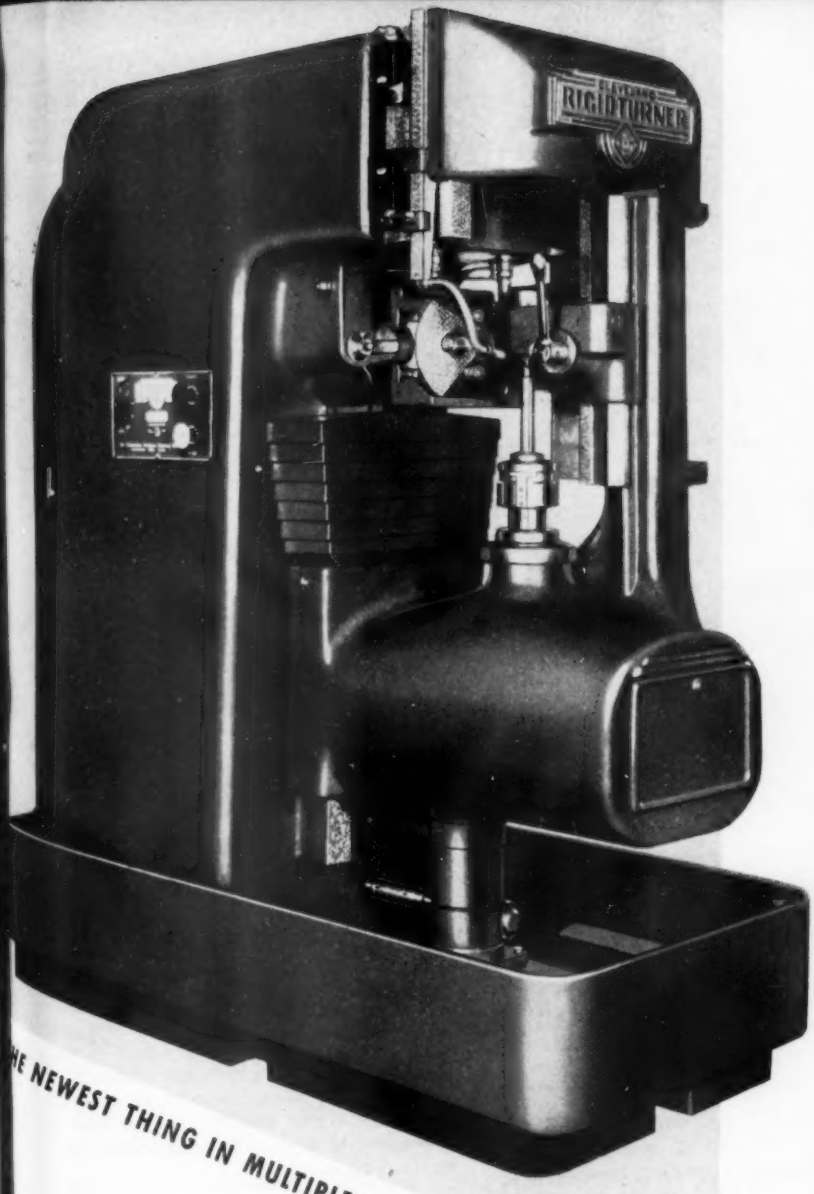
The aero-designed continuous wireway fluorescent lighting system brought out by Miller Co., Meriden, Conn., has a safety lamp lock which forms an integral part of each socket. The lock provides protection to prevent the

FOR MULTIPLE DIAMETER TURNING

In small lots or high production



THE RIGIDTURNER



THE NEWEST THING IN MULTIPLE DIAMETER TURNING...

• When the job calls for the accurate turning of several diameters whether in small lots or quantity—put it on a Rigidturner.

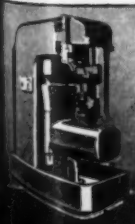
This is the newest thing in the accurate—faithful duplication of multiple diameter work.

On the Rigidturner the work advances past the cutter which is rotated in timed relation to produce various diameters.

The machine operation is automatic—all the operator has to do is load and unload the machine, press a button and the machine completes the operation.

Investigate this modern method of multiple diameter turning.

THIS BOOKLET tells how the Rigidturner works—what it does—and its many advantages on small lots or high production at amazingly low costs. Write for your copy today.



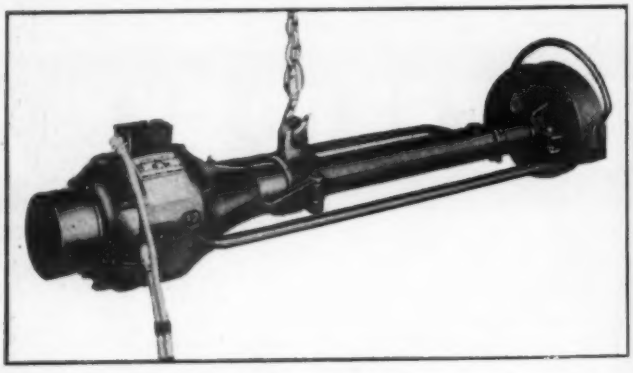
The CLEVELAND HOBBING

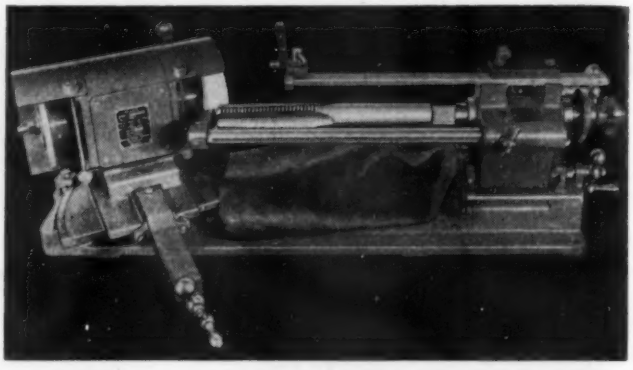
Cleveland... MACHINE Company... Ohio

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

lamp from falling out of the socket. Two or three light channel sections for 40 or 100 watt lamps are available.

The reflector is of Masonite with Ivanite finish for high reflection. It is light in weight and may be easily removed from the channel without disturbing any wiring. A reinforcing reflector attachment strap is an integral part of each reflector to provide additional flexibility and rigidity in attaching it to the channel. The top of the channel is flanged to permit the clamp strap attachment at various points along the channel for ceiling, rod or cable mounting to suit any ceiling structure. The straps fit into the continuous grooves of the channels. Provision is also made for chain suspension, conduit or combinations of these methods.





Vonnegut "In Between" Grinder Permits Use in Any Position

An "in between" grinder, made by Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind., is particularly suited to reducing seam welds of tanks and structural work. With built-up polishing wheels and buffs, it can be used for most kinds of metal finishing work. The combination of its light weight, swivel collar suspension and balance permit the grinder to be placed in any desired position and to apply the wheel to all exposed surfaces on all sizes and shapes of castings. A 3-hp. motor is furnished with this unit. The handle placement on each side and above the guide enables the operator to supply two-handed pressure to get maximum cutting from the 12×2 in. wheel. This grinder weighs 300 lb. It will snag the inside of large bell housings and similar work.

Grand Makes Quick Lockcet, Speed and Standard C Clamps

Three clamps recently brought out by Grand Specialties Co., 3103 West Grand Ave., Chicago, Ill., include the Quick Lockcet, the heavy-duty speed clamp and standard C clamp.

The Quick Lockcet is particularly for light, fast work and has an instantaneous trigger release. The seat of the clamp has a swinging, locking-lever gib which is said to assure a firm grip on any parallel, slanting or rounded surface. The release trigger is equipped with teeth which hold a ratchet grip on the screw under spring tension, which is released instantly with trigger pressure by thumb or finger so that the screw may be slipped to any desired position with a single motion for resetting. Or it may be instantly reclamped to other work of the same thickness without any further screw adjustment.

This clamp has a free acting swivel with a fiber face to prevent scarring, and is also furnished with complete fiber jaws for work on aluminum and other softer metals. Both types are made in three sizes and have copper plated screws and swivels.

The heavy-duty speed clamp is made for large work such as welding heavy plate, building dies and bulky weld-

ments. It is a two-handed, lever-operated device. A giant size with 10½-in. opening is also available.

The alloy-steel C clamp is designed for medium service, but includes a small clamp for heavy duty service. These alloy steel clamps have replaceable ball and socket swivels and feature the hardened screws and vise type handles copper plated against welding spatter. They serve as general use clamps for all purposes not requiring the heavy-duty device.

Blake Makes No. 2 Tap Grinder For Sharpening Long Taps

For sharpening the chamfer on taps up to 2 in. in diameter and 14 in. long, Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass., has produced the No. 2 tap grinder. This machine is provided with change gears for sharpening 2, 3, 4, 5, 6, 8 or 10 flutes, right or left hand. The grinder measures 14×19×44 in. and occupies a floor space 29×51 in. with pedestal, and weighs 185 lb. It is equipped with a fully inclosed ¼ hp., 110 volt, 60 cycle, 1 phase ball bearing motor.

The segment under the wheelhead slide is wide enough to allow the head to be swiveled for chamfer angle, either in the usual manner or around to the back of the work. The taps can be held in Blake bushings for rapid operation, in collets, or between centers.

For hand polishing the tap flutes a flute-polishing wheel of 5-in. diameter and ¼ in. wide is provided at the left of the wheelhead. Special spindles can be supplied for holding taps on the shank for sharpening taps with round shanks larger than ½ in. without squares or without the front center. One size spindle will hold diameters from ½ to 1 in., and the other from ½ to 1½ in. Special spindles must be used with a special collet for holding the bushings for taps under ½ in. in diameter. An individual collet for each diameter above ½ in. is necessary.

Tailstocks are available for grinding the front of 4 or 5 flute reamers and similar tools.

Rock-Tred Makes Kover-Oil For Sealing Surplus Oil

For sealing and covering surplus oil and grease which often splashes onto machinery, floors and other places, Rock-Tred Corp., 605 West Washington Blvd., Chicago, Ill., has developed Kover-Oil. It forms a hard coating

How Good are Your Gears?

SINE LINE

Equipment tells the real story—

Illustrated above: 2 of the Michigan "Sine-Line" gear checkers. At left to check involute and spacing. At right to check helical lead. (Sine-Lines also include gear checking recorders, hob checkers, speeders, etc.) ASK FOR BULLETINS.

THAT'S what Michigan designed them and builds them to do: to tell you more accurately—with no guess-work—how good your gears are coming off the line or what's wrong with them. Today, tomorrow, a year from now, they'll tell the same story—quickly and more simply.

THE "SINE-LINE" DOES IT

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . DETROIT 12, U. S. A.

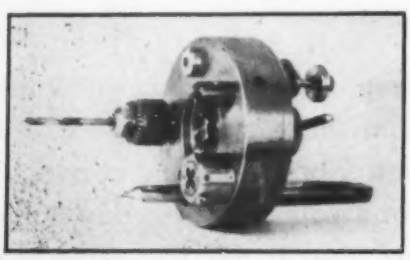
BUY U.S. BONDS STAMPS

over the surface and sets in about 20 min. It is said that a second application to porous materials prevents the oil from penetrating into them. When applied to asphalt it is said that this product prevents discoloration of the finished surface.

Kover-Oil is applied by brush or spray and is available in buff, gray, red and green, or in any color in quantities over 30 gal.

Huntsman Arc Welding Shield Equipped With Safety Lock

The Huntsman acetylene and arc welding shield is being offered by Davis Emergency Equipment Corp., 55 Halleck St., Newark, N. J. A locking device holds the shield in correct position before the face so that the line of vision passes through the lens at right angles to the surface of the glass. This lock also holds the shield above the head when not in use. A slight nod of the head lowers the shield into the correct working position. The device weighs about 1 lb.



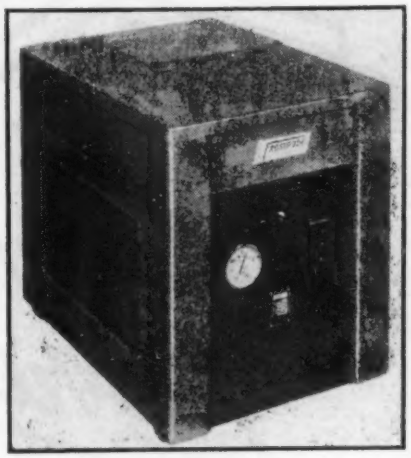
Koehler Tailstock Turret Permits Use of Five Tools

A tailstock turret has been brought out by Master Machine Co., 433 Main St., Stamford, Conn. Five different tools can be used on the attachment. Standard floating tap and die-holders or box tools for drilling, tapping or threading operations can be accommodated in the ⅝-in. holes in the indexing head. A No. 2 Morse taper is provided unless otherwise specified. This turret centers by means of a taper pin and is locked in position by a locknut.

Frostrode Coolant Cooler Uses Air-Cooled Compressor

Frostrode Products, 19003 John R St., Detroit 3, Mich., is making the Model 75-AC coolant cooler which is adaptable to most any type of machine and operation involving the use of coolants, and is especially suited for heavy cutting and high pressure grinding operations. Capacity of this cooler is 18 gal. per min. when cooled down to 20 F. below room temperature. The cabinet measures 30¾×22½×28 in. high.

The cooler is a compact, self-contained, portable unit, utilizing an air cooled compressor and operates independent of water services. The coolant temperature desired is selected by setting a dial on the panel of the cooler, and no attention is required by the

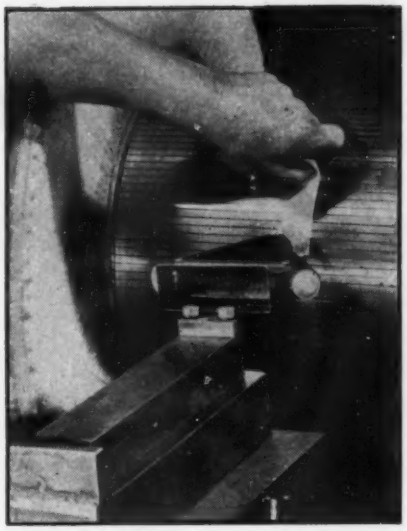


operator to maintain a continuous flow at the temperature selected. Variations in room temperature are automatically compensated for by an integral differential thermostat. Uninterrupted flow of the coolant through the cooler is obtained by a single-tube evaporator coil.

Compressor motors are designed for 220, 440 volts three phase or 115, 230 volts single phase, and are rated at ¾ hp., 60 cycles.

General Electric Indicator Checks Commutator Roundness

The vibration displacement indicator, made by General Electric Co., Schenectady, N. Y., indicates variations in roundness up to 0.00025 in. on commutators in motors running at high speed. It is a small, flat, triangular-shaped instrument with a projecting stylus. For this application, the stylus has a rounded end to prevent scratching the surface of the commutator. The indicator is mounted on a short metal bar which serves to hold it firmly



against the surface of the commutator.

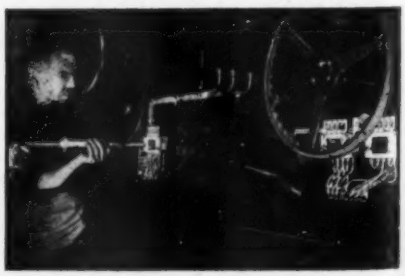
A thin sheet of paper is inserted between the stylus and commutator to protect the latter from being marked. As the stylus follows the vibration of the rotating motor commutator, it moves longitudinally in and out of the instrument. This movement is transmitted to a small pivoted mirror which reflects a light spot back and forth on the rectangular scale of the instrument. The length of this light path on the scale, calibrated in divisions of 0.001 in., indicates any variation in the roundness of the commutator. This indicator is furnished with either a 15 or a 30 mil scale range. Frequency ranges from 15 to 250 cycles per sec. when hand-operated, and from 0 to 250 cycles when mounted. Flashlight batteries provide power for the light source in the indicator.

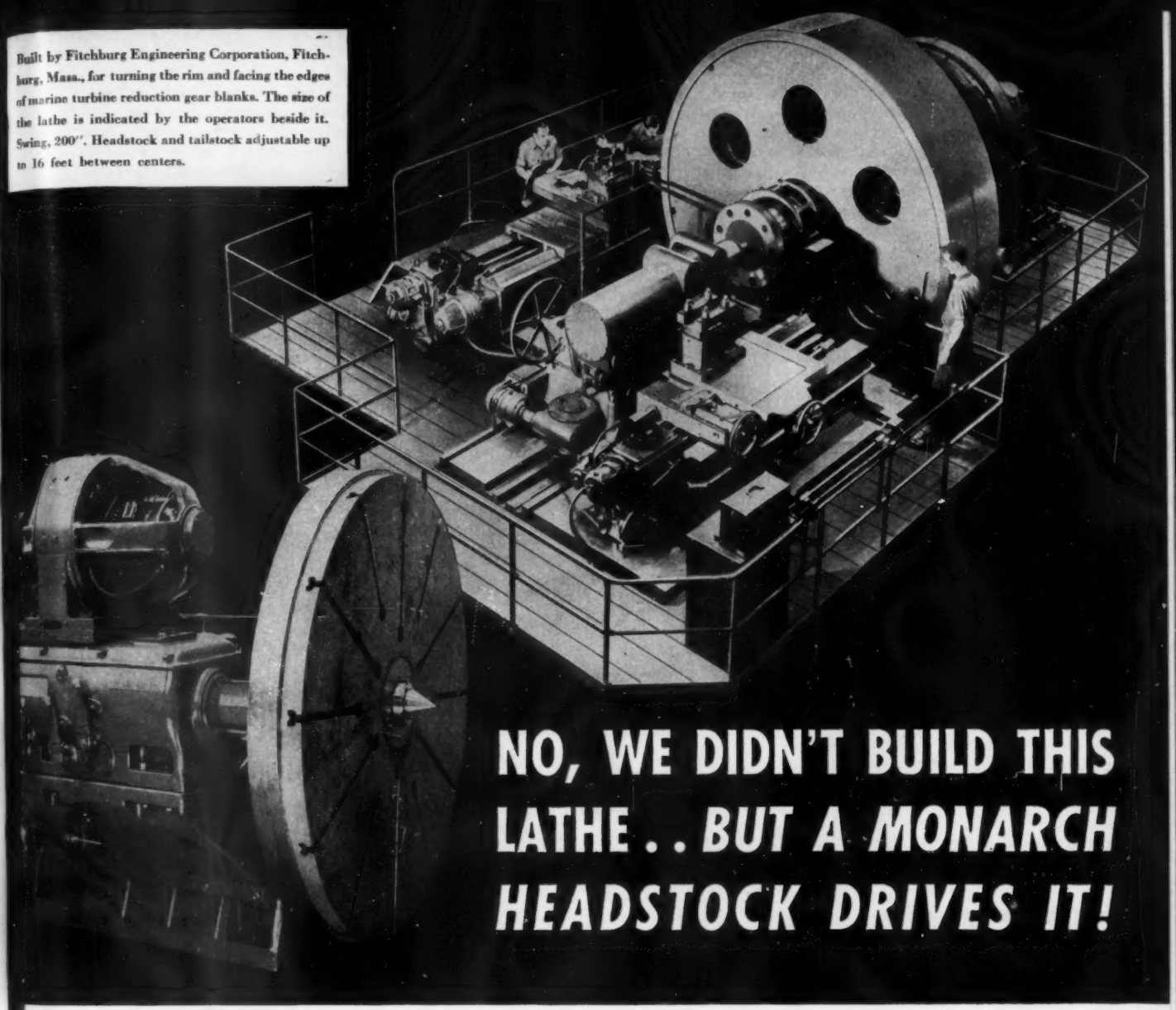
Multival Lubrication System For Use on Machine Tools

Farval Corp., Cleveland, Ohio, has developed the improved Multival system for positive lubrication of bearings on machine tools and similar equipment. Oil or grease under pressure is delivered to the distributing blocks by means of a manual or power-operated portable gun which serves as a central pump.

Multival equipment consists of the multiple valve blocks each serving two to ten bearings, lubricant lines leading to individual points, and suitable fittings to accommodate most types of bearing connections.

Each measuring valve can be in-





Built by Fitchburg Engineering Corporation, Fitchburg, Mass., for turning the rim and facing the edges of marine turbine reduction gear blanks. The size of the lathe is indicated by the operators beside it. Swing, 200". Headstock and tailstock adjustable up to 16 feet between centers.

NO, WE DIDN'T BUILD THIS LATHE . . BUT A MONARCH HEADSTOCK DRIVES IT!

Selection of Monarch headstock for this Fitchburg lathe is evidence of the power and dependability of the Monarch mechanism. Its "huskiness" and rigidity amply qualify it for this work, and the 30 hp motor provides plenty of driving power.

Few manufacturers require equipment of this type. However, every user of lathes must be sure that his equipment has the stability, the toughness, the rigidity and the power, combined with unfailing accuracy in performance, to carry out the requirements of his work.

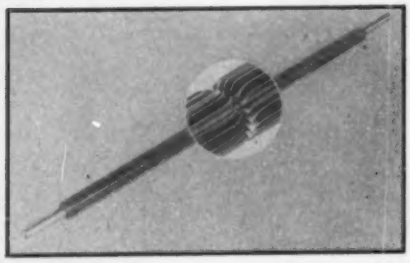
The selection of Monarch lathes, for a wide variety of work in war production, was based upon their proved productivity in peacetime. These same qualities are being maintained and amplified, today.

Manufacturers planning their peacetime operations are invited to consult with Monarch engineers on their lathe requirements.

MONARCH LATHES
Save Time

THE MONARCH MACHINE TOOL COMPANY · SIDNEY · OHIO

dividually adjusted to deliver the required amount of lubricant for the bearings which it serves. The positive delivery of the lubricant to each bearing is indicated on each valve piston. The bearings can be lubricated with safety while the equipment is in full operation if the blocks are mounted at accessible points on the machine.

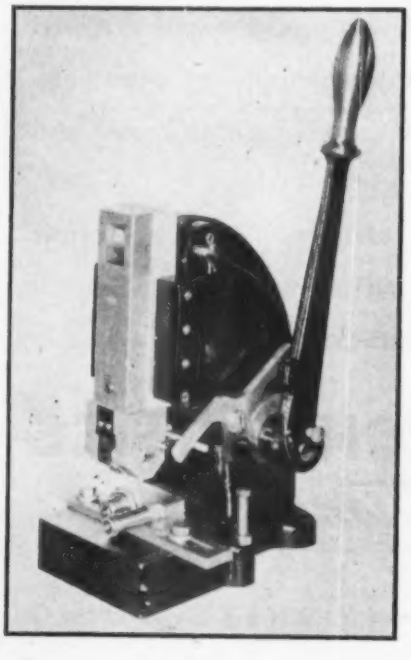


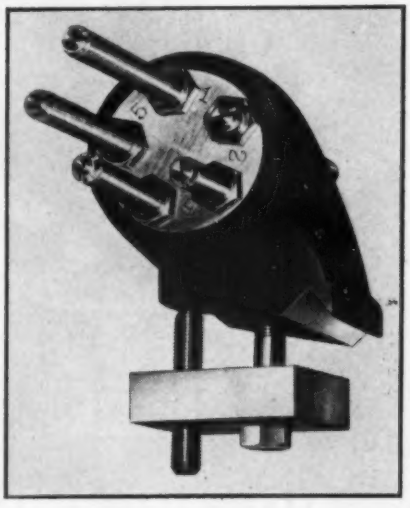
Brown Cut and Twisted Fintube for Increased Heat Transfer

Cut and twisted fintubes have been developed by Brown Fintube Co., 160 Filbert St., Elyria, Ohio. These consist of the standard types of Brown longitudinal fintubes with the fins cut transversely at desired intervals and the ends twisted. This design is said to produce greater turbulency of the shell side commodity, and to produce increased thermal efficiency in sectional hairpin and other types of heat exchangers in which the shell side commodity is held closely against the fintube, resulting in still further savings in weight and pressure drop.

Force Numbering Machine Fitted With Automatic Head

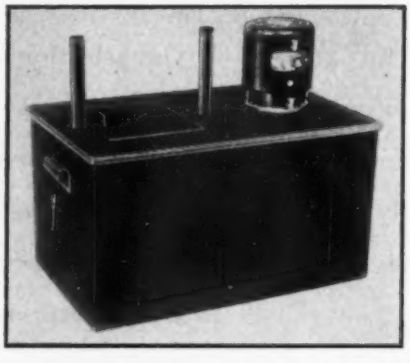
The serial numbering machine made by Wm. A. Force & Co., 216 Nichols Ave., Brooklyn 8, N. Y., is used for serially numbering two or more mating parts with the same number. This hand bench press is fitted with an automatic numbering head with a special trip cam arranged for consecutive, duplicate or other type of numbering required for the matching of small parts with the same serial number. The modified toggle lever movement enables the operator to exert considerable pressure for marking hard parts, yet control of pressure is such that watch and instrument parts can be marked without harm.





Victor Multi-Stop Attachment Will Fit Any Engine Lathe

A multiple carriage stop for attachment to an engine lathe is offered by Marshall Tool & Supply Co., 1224 Santa Fe Ave., Los Angeles, Calif. It has five position settings. This ADT Victor Multi-Stop is made for all V-bed as well as Atlas-Craftsman lathes, and clamps to the ways. Cross-slide Multi-Stops are also available.



Eastern Portable Coolant Pump For Lathes, Shapers, Grinders

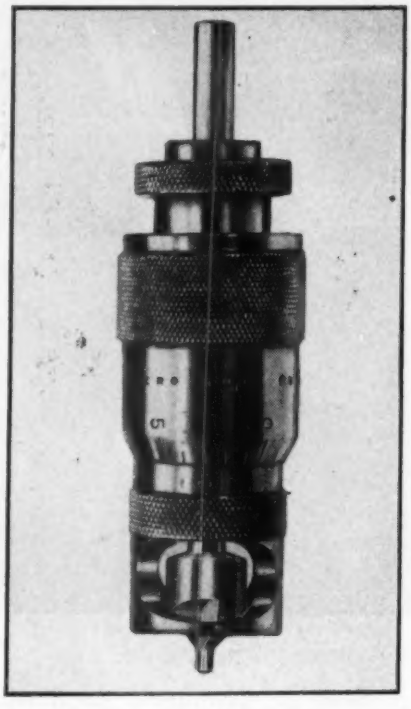
Eastern Engineering Co., 45 Fox St., New Haven, Conn., has developed a self-contained portable coolant pump, Model 16-S, which is suitable for installation in a small space. The tank size is 16×10×9 in. high, and the motor height is 4¾ in. above the tank. The motor is suited for operation on 100 volt, 60 cycle, single phase current, and is airjacketed, fan-cooled.

The coolant pump is designed for use on lathes, shapers, milling machines, drill presses, grinders and other equipment where a steady flow of coolant or cutting oil is required.

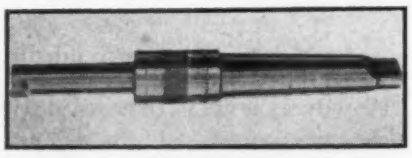
The centrifugal-type pump operates at a maximum pressure of 4½ lb. per sq. in., and it has a maximum capacity of 3¾ gal. per min.

Aero Split Keeper Lock Improvement for Countersink

A split keeper which gives positive set to the retainer collar on bearings has been incorporated in the micrometer stop countersinks manufactured by Aero Tool Co., Burbank, Calif. This locking feature is designed to prevent vibration from loosening the bearing retainer and causing damage to the tool or material.



The keeper inserts work on the slotted taper shaft principle, whereby all force is directed toward the shaft center under constant, even pressure. No tools are required to disassemble the unit.



Mikro-Lok Jig Boring Bar Has Micrometer Adjustment

Universal Engineering Co., Frankenmuth, Mich., has brought out the Mikro-Lok self-locking jig boring bar for finishing cuts, especially to boring a shoulder or the bottom of a hole. The bar is also suitable for making

NO FRICTION HERE . .

The lads who fly our bombers are teamed temperamentally for friction-free and split-second co-ordination to beat the enemy to the punch. They are the height of "all for one, one for all."

Likewise, in their "Suzy Q's" and "Fat Emma's," tons of intricate machinery and instruments turning on thousands of ball bearings function freely, smoothly and accurately—all to one paramount purpose—defeat to the Axis.

And teamed with men and mechanism, New Departure Ball Bearings are carrying the brunt of this job—reducing friction, keeping things cool, postponing wear and maintaining precise location of parts. In fact, New Departure has a major responsibility in the whole ball bearing war production program.

NOTHING ROLLS LIKE A BALL

NEW DEPARTURE
ball bearings—as near perfection as engineering science can make them—help to keep 'em...flying... rolling...firing...winning

New Departure
BALL BEARINGS

3189

. . . Help America to hasten Victory—Buy War Bonds Today

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

They Switched to Technite
One munitions producer, after running tests, switched to Capewell's Technite hack saw blades for cutting 12"x15" breech block stock. It is likely that you, too, face difficult cutting problems. Simply ask your mill supply man about Capewell.
CAPEWELL
The Trend is to TECHNITE
The Molybdenum High Speed Hack Saw Blade
THE CAPEWELL MFG. CO., HARTFORD, CONN.

intermittent cuts. Seven size ranges are offered for boring holes from ¾ to 4 in. inclusive. The bars are available with taper shanks for Swiss jig boring machines and Morse taper shanks, straight shanks and a variety of flanges for diamond boring machines. Several sets of blades may be arranged with tandem or independent Mikro-Lok adjustment.

The blade can be set to close limits by a micrometer adjusting dial located within the bar. The adjusting mechanism is inclosed to provide free operation of the boring bar. Because the blade protrudes beyond the end of the bar, the chips readily fall ahead of the bar.

Reanite Bonding Process Joins Metal and Plastic

The Reanite process, developed by U. S. Stoneware Co., Akron, Ohio, is suitable for most all metals, and provides a method of bonding metal to metal, rubber, synthetic rubber, plastics, leather or wood.

The surfaces to be joined are brushed, sprayed or dipped with Reanite. After drying, mild heat and pressure are applied. It is said that the joint is unaffected by fresh or salt water, is non-corrosive to metal, possesses corrosion-resistance in itself and high dielectric strength. Reanite bonding is said to retain its strength over a temperature range of from -40 to as high as 300 F.

TRADE PUBLICATIONS

ABRASIVES Behr-Manning, Troy, N. Y., has published a "Handbook for Distributor Salesmen," which illustrates and gives fundamental information on the manufacture, storage, and usage of coasted abrasives, as an aid to that firm's distributor personnel.

BELT GRINDING A brochure on precision "wet belt" machining has been issued by Porter-Cable Machine Co., 1714 Salina St., Syracuse, N. Y.

CHIP BREAKER GRINDER Technical bulletin GT-158, giving complete specifications of a new higher capacity and more flexible chip breaker grinder has been made available by Carboloy Company, Detroit. Included are photographs and descriptions of how to use the new machine for grinding both angular and parallel type chip breakers, as well as grinding breakers in roller-turner tools.

COATED ABRASIVES A pocket-size pamphlet issued by Behr-Manning, Troy, N. Y., describes, pictures and gives prices of that company's line of coated abrasive "Spirabands," "Spriapoints," metal cloth pencils, slotted disks, special cones and metalite fiber combination disks.

CONNECTORS Cannon Electric Development Co., 3209 Humboldt St., Los Angeles, Calif., has issued a file-size catalog giving description, applications, illustrations, sketches and tabular data on Type DP rack and panel electrical connectors.

CRANES Arranged in simple question and answer form and indexed for quick reference, a handy pocket-size manual for servicing overhead traveling cranes is available from Crane Division, Harnischfeger Corp., Milwaukee, Wis.

DEBURRING AND POLISHING MACHINES Bulletin No. 401, describing rotary table automatics, is announced by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo 54F, Mich. Construction features are given and a complete table of specifications is tabulated for ready reference. Requests should be made on letterhead.

DERMATOSIS To help combat absenteeism of machine operators due to skin infection and rashes, the Quaker Chemical Products Corp., Conshohocken, Pa., has prepared and is offering for free distribution to plant superintendents and shop foremen a printed card giving seven tips on the protection of the skin.

DRESSING TOOLS Wheel Trueing Tool Co., 3200 West Davison Ave., Detroit 6, Mich., has issued a catalog featuring its blade type tools for wheel dressing.

DRESSING TOOLS A catalog issued by Cleveland Industrial Tool Corp., 4713 Euclid Ave., Cleveland, Ohio, describes that firm's line of dressing tools and diamond pointed turning and facing tools, and contains a chart showing the application of diamonds and other hard minerals as working tools, as applied to various industries.

ELECTRONICS A 24-page nontechnical (GE-4116) book titled "How Electronic Tubes Work," has been produced by the General Electric Electronics Dept. (6-125), Schenectady, N. Y. Designed primarily for industrial engineers, the book is a primer emphasizing the operation of the electronic tube.

ELECTRONICS A simple introduction to the electron and the principles that govern its use, entitled "Primer of Electronics," GED-1068, is available from the Advertising Division, Electronics Department, General Electric Co., Schenectady, N. Y.

END MILLS Melin Mills, 2228 Bellevue Ave., Detroit 7, Mich., is launching an information program on how to make end mills last longer and produce more. The company has made available to plant owners booklets,

W-S Standard Lathe Centers with carbide tips. Morse, Brown & Sharpe and Jarno tapers for both TURNING and GRINDING.

SAVE ON SET-UP, ADJUSTING and GRINDING TIME with these more *accurate* W-S Lathe Centers. Their concentricity is *guaranteed* to within .0002" or less! Made by entirely different method of manufacturing, W-S Centers help assure the highest degree of precision work from your machine tools. Genuine CARBOLOY tips (other carbides may be specified) reduce friction and give a cooler, more perfect bearing. The craftsmanship inherent with all W-S Centers goes far beyond the point of visual inspection. However, it is evidenced in their ability to maintain greater accuracy while outlasting from 10 to 60 ordinary centers. Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. The majority of sizes is available from stock most of the time. Write for FREE Catalog 942-A and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

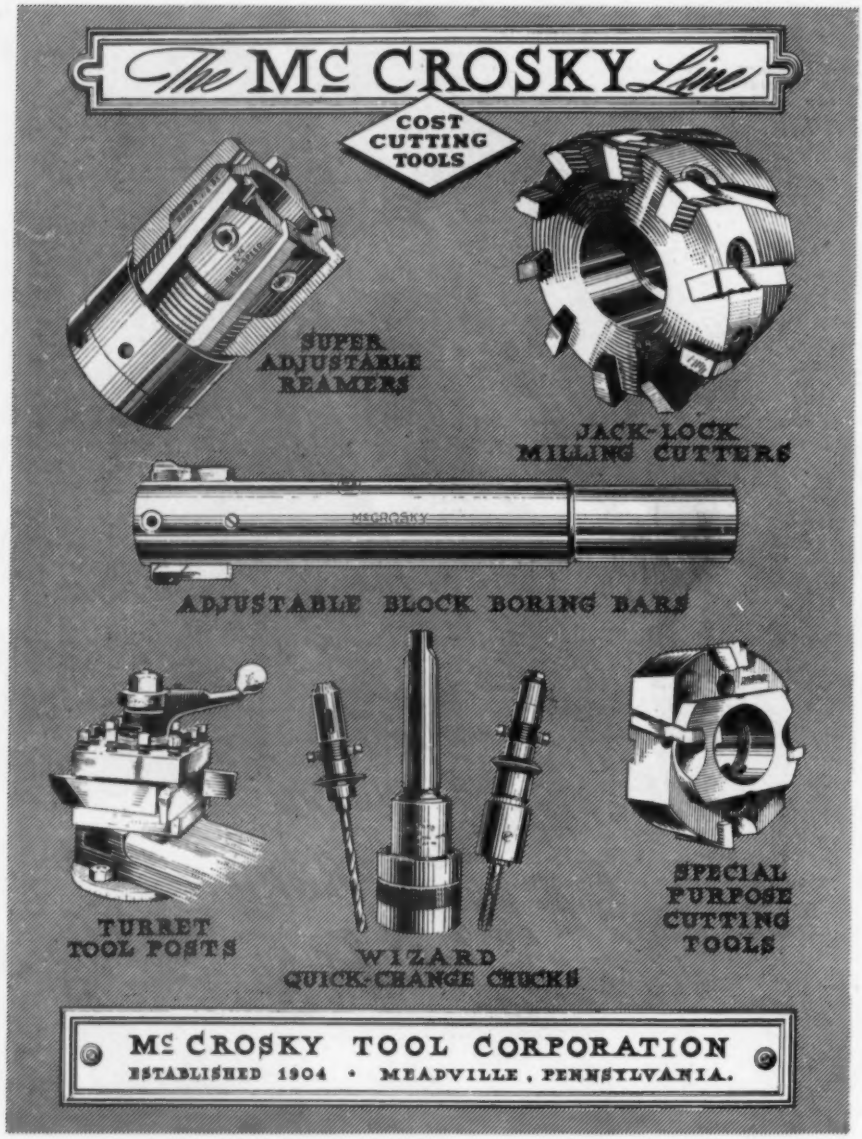
W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: 1/2 to 1-1/2.

W-S Standard Reamers with Carbide Tips. Tapered and straight shanks. Sizes: 1/4 to 1-1/2.

WENDT SONIS

CARBOLOY CUTTING TOOLS

CENTERS ★ DRILLS ★ CORE DRILLS ★ COUNTERBORES ★ SPOT FACERS
END MILLS ★ REAMERS ★ HOLLOW MILLS ★ LATHE BITS ★ SPECIAL TOOLS



EXPERT CRAFTSMANSHIP and tested skill in the selection and heat-treatment of steels, backed up by thirty years' manufacturing experience, make McCrosky's metal-cutting tools and machine-tool attachments leaders in their respective fields. Each McCrosky unit is a combination of exclusive, carefully engineered features—developed out of painstaking observation of productions and maintenance problems.

There are bulletins, manuals and engineering data sheets on the various units in the McCrosky line of Cost Cutting Tools. Ask for this material by unit name.

posters, charts, bulletins and other printed aids to help them quickly to import the "know how" of end mill operation.

FANS Buffalo Forge Co., 448 Broadway, Buffalo 4, N. Y., has published a data booklet on the maintenance and installation of its line of industrial fans and air-conditioning equipment.

GAGE BLOCKS The George Scherr Co., 128 Lafayette St., New York 13, N. Y., has published a 4-page reprint which illustrates and describes the numerous uses of gage blocks, as employed in both inspection departments and in the machine shops.

GLOVES A new catalog section on its line of Anode process acid and industrial rubber gloves has been issued by The B. F. Goodrich Co., Akron, Ohio.

GEARING The Cone-Drive Division, Michigan Tool Co., Detroit 12, Mich., has published an instruction manual (Manual CA-43) on how to assemble cone-drive area-contact gearing in housings, how to check assemblies, etc. Included in the manual are detailed instructions as to the simplest methods to follow to assure maximum efficiency of operation as well as correctness of assembly.

GRINDER Catalog No. 5, covering the operation and new construction features of the No. 1 Blake tap grinder, as well as complete details on the new No. 2 Blake tap grinder, has been announced by Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass.

HEAT TREATING Despatch Oven Co., Minneapolis 14, Minn., offers a newly printed bulletin No. 83, presenting that firm's line of standard tempering and drawing furnaces.

HEAT TREATING G. S. Rogers & Co., 228 N. La Salle St., Chicago 1, Ill., has prepared a new general products bulletin describing the heat treating and metal working products that company manufactures.

HEAT TREATING Hevi Duty Electric Co., Milwaukee, Wis., has published Bulletin HD-643, "Protective Combusted Atmosphere in Hevi Duty Furnaces." It includes descriptions, specifications and pictures of "Hevi Duty" furnaces, and "deals with atmospheres having a combusted gas base as distinct from those formed by direct cracking of raw gases or hydrocarbon oils."

HYDRAULIC UNITS A bulletin published by The Denison Engineering Co., 1195 Dublin Rd., Columbus, Ohio, gives a picture of the range of hydraulic units manufactured by that firm, as well as the diversified type of

equipment to which hydraulics is being applied.

LAPPING COMPOUND A folder prepared by Timesaver Products Co., 1115 Post St., Seattle, Wash., describes the uses and advantages of the lapping compounds manufactured by that firm.

LIGHTING "Industrial Hygiene and Plant Efficiency Through Good Lighting," published by the Division of Labor Standards, U. S. Department of Labor, Washington 25, D. C., reprints detailed lighting standards developed by the Illuminating Engineering Society.

LIQUID CARBURIZERS The A. F. Holden Co., New Haven, Conn., offers a new bulletin on its liquid carburizing baths. This bulletin gives the necessary instructions to operate such a bath and also describes different results to be obtained at various times and temperatures.

LUBRICATION The Farval Corp., 3293 East 80 St., Cleveland 4, Ohio, has published an 8-page bulletin, "The Multival System," described as an improved method of providing positive lubrication to a group of bearings from a central distributing block. Other Farval manual and power systems are shown, with a directory of company sales and service offices.

LUBRICATION Acheson Colloids Corp., Port Huron, Mich., has issued a 4-page illustrated bulletin, No. 431-E, on "dag" colloidal graphite for impregnation and surface coatings.

METAL CLEANING "Surface Preparation of Iron and Steel for Zinc and Bright Plating" is the title and subject of a service report prepared by the Technical Engineering Laboratory, Oakite Products, Inc., 22 Thames St., New York, N. Y.

METAL FINISHING Illustrated bulletin No. 19 issued by the American Foundry Equipment Co., 555 South Byrkit St., Mishawaka, Ind., describes that firm's metal washing machine, designed to meet the need for high-speed washing of flat, fragile work or circular parts with intricate pockets and crevices.

METALLIZING A 40-page catalog published by The Metallizing Co. of America, 1330 West Congress St., Chicago, Ill., deals with all phases of the metallizing process. Information is given on how this process is saving time, money and precious metals in production, maintenance and corrosion prevention. All information is classified according to industry.

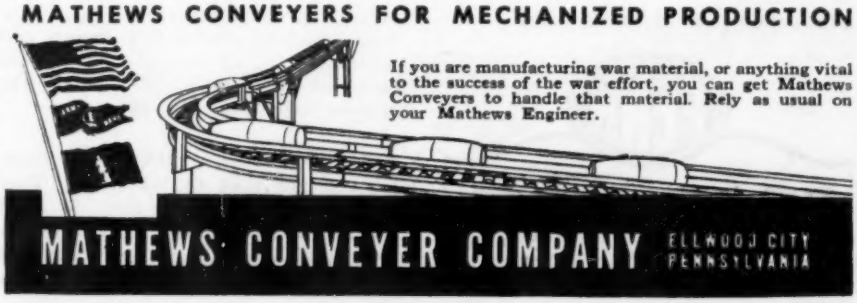
METAL TESTING A 21×30 in. wall chart guide for spark testing tool steels is offered by the Carpenter Steel

THE *Strategy* OF MAN-POWER

RELIEVING VITAL MAN-POWER of unnecessary fatigue . . . avoiding unnecessary handling . . . saving unnecessary steps . . . keeping a constant flow of material moving to waiting hands and machines, that's man-power strategy headed towards victory.

America's war industries from coast to coast are improving their per-man-and-machine-hour production schedules with the aid of Mathews Time-Coordinated Conveyer Systems.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION



If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

On the Wings of Victory

AMERICAN armadas of the air fly across the oceans, carrying fighting men and equipment to the battle fronts of the South Pacific, the Mediterranean, China, Britain — wherever there is need.

The dependability of our flying, fighting craft strikes terror to Nazi and Jap. While, here at home, the daily expanding production of planes and arms encourages everyone as to the final outcome.

To contribute even in a small way to the great achievements of war production is something industry may well be proud of, for it serves as an incentive to greater effort in every shop and factory.

Fenn precision built parts are being turned out in constantly growing volume and flowing with all speed to the final assembly of planes, ships, tanks and guns. Fenn's entire output is devoted solely to war work.

Eventually Fenn will be back at the usual occupation of building special machinery, tools and equipment for peace-time industry. In the meantime they welcome inquiries from manufacturers and producers who have a production job calling for help.

FENN

THE FENN MFG. CO.
HARTFORD, CONN.
ESTABLISHED 1900

MOTOR MAINTENANCE The Keystone Electric Co., 1226 Ridgely St., Baltimore 30, Md., has prepared a new catalog illustrating ball bearing motor end bells, for the conversion of sleeve bearing electric motors to ball bearing operation.

MOTORS Gear motors are featured in a new 16-page, illustrated bulletin, GEA-1437D, recently issued by the General Electric Co., Schenectady, N. Y. The bulletin describes the many types of gear motors now furnished by that company, lists their advantages, and indicates the various locations where their use is most desirable.

PLASTICS Catalog III on "Injection Molded and Extruded Plastics," is now available from Dept. T, the Elmer E. Mills Corp., 812 W. Van Buren St., Chicago. It is a 40-page book of which 16 pages are four-color reproductions of products of that company.

PNEUMATIC DEVICES Mead Specialties Co., 15 South Market St., Chicago 6, Ill., has issued a new catalog describing and illustrating its complete line of products.

POLISHING A pocket-size wheel speed table has been published by the Engineering Dept., Divine Brothers Co., Utica 1, N. Y., for those engaged in polishing and buffing.

PRODUCTION Available without charge from Corbalt, Inc., Ann Arbor, Mich., is the Corbalt production calculator, a chart that simplifies the calculations for machining operations.

PUMPS A revised pump maintenance check chart, printed in two colors on heavy bristol board, is available from Blackmer Pump Co., 1703 Century Ave., Grand Rapids, Mich.

SURFACE PLATES The Barco Scraping Co., 1975 East 65 St., Cleveland, Ohio, offers a folder describing its line of surface plates and detailing their advantages.

TAPPING An 8-page pamphlet available from the Cleveland Tapping Machine Co., 1725 Superior Ave., Cleveland, Ohio, covers tapping speeds and lubricants for all the common metals. Included is a table for finding the spindle speeds for any given tap.

TEMPERATURE CONTROL Catalog A4 published by Automatic Temperature Control Co., Inc., 34 East Logan St., Philadelphia 44, Pa., covers Type 2 automatic valve operators. The literature covers essential engineering

LAMINUM shims make it easier to keep your factory production machine or field service machine at top form.

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

Laminated Shim Company
Incorporated
50 Union Street • Glenbrook, Conn.

LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT
2039

information, design features, and operating data. Electrical data and force-torque information are shown in tabular form to assist in the speedy selection of the proper control mechanism.

THREAD ROLLING Rolled Thread Die Co., Dept. AM, Worcester, Mass., has published a "Thread Rolling Hand Book." It contains technical information of interest to persons concerned with the design, production or purchase of screws and other threaded parts. Copies are available to those making requests on company letterheads.

VALVES Darling Valve & Mfg. Co., Williamsport, Pa., has available a new catalog embodying special features in valve cataloging and engineering data, with special emphasis on readability and indexing for quick reference.

VISES, PRESSES, SPACERS Bulletin No. 643 published by the David J. Ross Co., Benton Harbor, Mich., describes, pictures and prices that firm's line of vises, presses and spacers.

WASH FOUNTAINS Bradley Washfountain Co., Milwaukee, Wis., has available Catalog 4308 illustrating and describing that firm's wash fountains, multi-stall showers and drinking fountains as redesigned to save vital war materials. Specification data on washroom planning suggestions are included.

WELDING The complete line of arc-welding accessories offered by General Electric Co., Welding Division, Schenectady, N. Y., is presented in Bulletin GEA-2704C.

NEW BOOKS

SHOP MATHEMATICS—*By Arthur A. Dick, coordinator, Vocational War Production Training, Baltimore County, Md., 230 pages. Published by the Ronald Press Co., 15 East 26 St., New York.* $2.40.

School mathematics are usually taught according to academic classifications of the subject. The student takes arithmetic one year, algebra another, geometry the next and trigonometry the following year. This procedure follows high school textbooks and has certain advantages in concentrating the mind of the student upon one kind of mathematics at a time.

Vocational mathematics are something else again. Many of the common shop problems call for the use of several kinds of mathematics in combination. Mr. Dick's book has been prepared to meet the specific needs of the vocational school student. It treats the subject without reference to subject classification, but rather through the use of practical shop problems.

KEEP YOUR AIR POWER

Hitting the Collar

KEEP your air tool power at "new tool peak"... by oiling the air that drives it!

NORGREN LUBRICATORS, installed directly in the air line, inject a fog of oil into the air stream...lubricating every moving part. Check wear during use. Stop destructive corrosion when idle.

Automotic . . . start and stop with the tool. Sight-feed . . . ends guesswork. Size, type, and combination for every requirement. For complete information write . . .

C. A. NORGREN CO., 220 Santa Fe Drive, Denver, Colorado

Over 110,000 Norgren Lubricators now oiling the Battle Lines of Production!

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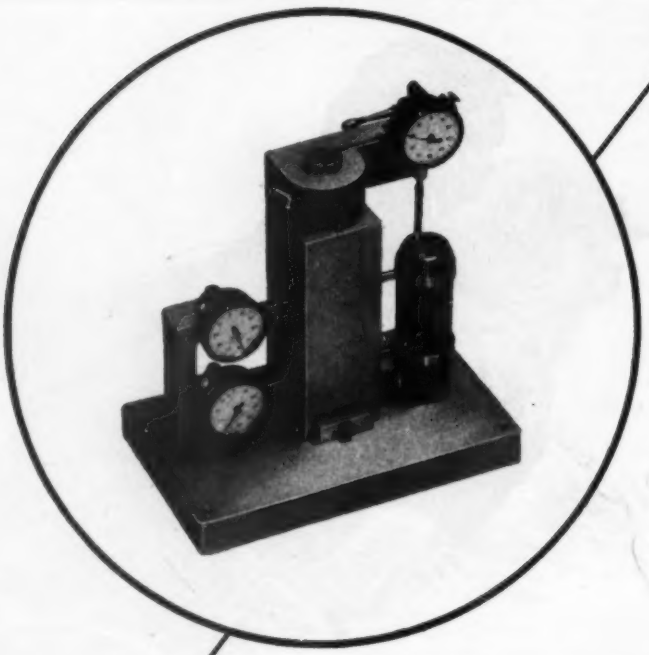
CATALOG 400-M



SPECIAL GAUGES
by TURNER

Illustrated above is a Special Gauge made by Turner. This gauge is just one of the hundreds of Special Precision Gauges Turner makes for manufacturers who require their own particular type of gauge to check certain precision operations on their production lines. Turner's Engineering Department has played an important part in assisting in the design of these gauges and the Turner Company invites you to write them if you have a checking problem that requires a special built gauge.

TURNER BROTHERS
TURNER GAUGE GRINDING COMPANY
2628 HILTON ROAD • • • • FERNDALE, MICH.
THE HOME OF TURNER PRECISION BUILT GAUGES

The text is divided into teaching units. Each is intended to represent approximately a day's assignment for a student, but of course, there is no hard and fast rule as the handling of the text will depend on previous preparation and the student's ability to absorb mathematical training.

METALS AND ALLOYS DATA BOOK — *By Samuel L. Hoyt, technical advisor, Battelle Memorial Institute. 334 pages. Published by Reinhold Publishing Corporation, 330 West 42 St., New York.* $4.75.

The author emphasizes that this book is for information, not for instruction. He places no emphasis on principles and practices; instead it is a compilation of data on metals and alloys for reference purposes.

As a source of metallurgical data, the volume is exceptionally complete. Topics range from aeronautical material specifications for stainless steels, to the creep and fatigue strength of lead alloys. Nearly all the data is in the form of tables and graphs.

SEEN and HEARD

By JOHN R. GODFREY

Postwar Rubber

Nationalism dies hard. Many enthusiasts for our wartime material substitutes see in them a future of industrial self-containment. Rubber is a good example. Before the war, we were dependent on foreign sources of supply. Now we are well on our way toward filling our needs by the domestic production of synthetics. Ernest Bridgewater, manager of du Pont's Rubber Chemical Division, recently pointed out that on a price and quality basis, synthetics can retain only a portion of their wartime applications under peacetime conditions. And, if we share Wendell Willkie's sentiments as expressed in "One World," we could make no greater mistake than by shutting out natural imports through artificial barriers.

Glass Gages and Glass Bearings

Glass plug, ring and snap gages seem to have made a place for themselves in manufacturing plants of different kinds. Although not as hard as some heat-treated steels, they wear longer in gaging practice. The reason given is that the coefficient of friction between glass and steel is less than between steel and steel.

This calls to mind an experiment many years ago, perhaps about 1870, when a railroad in New England experimented with glass for locomotive driving box bearings. I have no details as to why they were abandoned—probably on account of breakage or because they had no good way of producing a satisfactory surface on the glass

blocks. It would be interesting to see further experiments with modern tempered glass and with bearing surfaces as smooth and as uniform as we can now make them.

Machine Tool Shops Busy

With the greatly increased output of the machine tool shops having met the primary war demand, some of the enlarged plants are turning to contract work and with considerable success. One turret lathe builder is making large quantities of valves for the Liberty ships on a subcontract. Naturally, they are doing a good job as would be expected. The valve makers use their turret lathes to make valves, so the lathe builders are naturally well equipped for such a job.

One helpful phase of this might easily be that the machine builder will learn of possible improvements in his machining both from the point of convenience and efficiency. He may even learn that some of his "gadgets" are really of little practical use in production. Another angle is that in becoming a valve manufacturer, he is competing with his former customers and with those who might be his customers when the emergency is over. The manufacturing experience should be good for him and for his future customers, no matter who they may be.

Double Pay for Idle Time

ROBERT MAWSON

To state a basic principle, "management engineering, by means of improvements in methods, enables an operator to produce or perform more work in a given period than he did before." As a result of these improvements in procedure the operator by continued steady performance is able to increase his earnings.

However, in a small plant, where I was installing a cost reduction system, I recently introduced a procedure entirely opposite to what is considered conventional. In this plant they had a man whose duties were the servicing or keeping in operation twelve small punch presses.

Each machine was operated by a girl, all on incentive rate of pay. However, when a machine was down for repairs the girl checked out and went on an hourly pay basis until her machine was in operation again.

I found that often four or more machines were down for repairs and much dissatisfaction was prevalent; the earnings of the girls were reduced, through no fault of theirs, production was curtailed and manufacturing costs were increased, the latter being a constant complaint from the management.

The president called a meeting to see what was the best solution to the problem, and the service man was asked for his opinion. His reply was, "Get another man to help me, there is too much work for one man." At this

LUFKIN
TELESCOPING GAGES
AVAILABLE IN SIX SIZES
OR COMPLETE SETS
ARMY
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NAVY
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LUFKIN
A FINE TOOL FOR MEASURING INSIDE DIAMETERS
With a Lufkin telescoping gage the inside diameter of slots or holes can quickly be determined to within less than one thousandth of an inch.
Plungers are kept under constant spring tension and a slight turn of knurled screw in end of handle locks the plungers for reading. Unlike other similar tools, the handle on a Lufkin telescoping gage locks in the center, assuring perfect balance so essential to accuracy.
The smallest gage will enter a 5/16" hole. The largest measures up to 6" diameters. Available singly in six different sizes or in complete sets of four or six in an attractive red leatherette case.
See your jobber and write for catalog.
BUY THROUGH
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LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

WOODY SPENCER SAYS:—

"TAP-MAINTENANCE IS IMPORTANT"

No. 6 in a series of WOOD & SPENCER "KNOW HOW" messages.

Job-results reflect the condition and efficiency of the tools used. Therefore, select and maintain taps carefully. To aid you in this we offer the following suggestions.

1. Cutting edges are easily nicked or dulled. In view of this, handle and store taps so that the threads are not damaged.

2. Taps should be oiled when not in use. This will prevent corrosion and greatly increase tap-life and efficiency.

3. Often just a small nick or a dulled thread will ruin a job. Avoid losses of time and material by carefully inspecting the tap to be used.

4. Taps should be chamfered carefully. If a tap is chamfered out-of-round the resulting uneven contact will cause poor threads.

5. Broken teeth should be ground out. Otherwise they will cause the tap to break.

Do you have a special tapping problem? Write to us . . . from customers blueprints we quite frequently make recommendations.

"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company

Cleveland, Ohio

point I asked the president to postpone his decision for a day or two until I made a careful study and then report my findings.

As I watched the activity, or absence of it, of the service man, I was convinced that he was "nursing" the job with the idea of getting an assistant. I was more convinced of this fact when I took time studies of the several jobs he did on servicing the machines.

With this information I asked the service man to come into my office for a chat. I then told him that from my studies and investigation I was convinced he could keep these machines in operation without any trouble. And as a business proposition I said that during the time he was working on and servicing the machines he would get a certain rate of hourly pay.

However, when he was not working, in other words, when all the machines were in operating condition he would receive twice this hourly rate of pay. All entries on his time card being O.K.'d by the plant superintendent.

The man, I suppose, thought I was foolish when I described the arrangement to him and no doubt the president was sure I was demented as he asked, "Why you are paying the man a premium to loaf?"

Well the method was installed and worked successfully and it was surprising how quickly the man was able to get and keep the machines in operation.

The results of this innovation were increased earnings for the girls, greater production, reduction in manufacturing costs and a saving of the additional set-up man.

Warm Bearings Aid Assembly

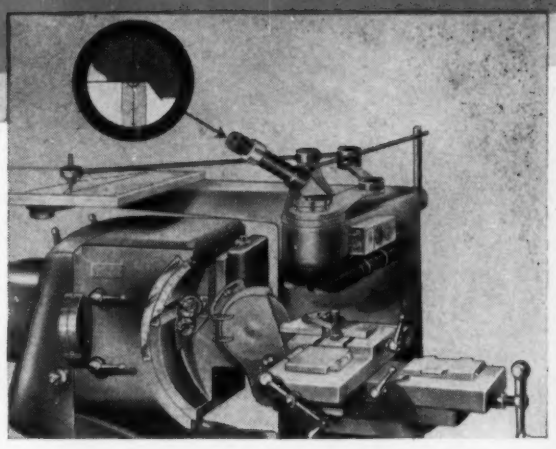
Ball and roller bearings can be put into assemblies more readily if they are heated slightly. The heat makes it easier to remove the grease that protects them from rust and to fit them to the shafts. Some plants make it a practice to immerse antifriction bearings in warm oil after cleaning and before sending them to the assembly department.

The Blanchard Machine Company has discovered a better way. Cartons containing the bearings are placed in the field of a demagnetizing unit ordinarily used for parts which have been held on a magnetic chuck. The alternating field of the unit has an induction heating effect on the bearing.

This is not high-frequency heating as used in standard heat-treating equipment, since the standard low cycle current in the shop circuit is used. However, the effect is sufficient to make the bearings warm to the touch which is all that is necessary. The advantage of the method is that the bearings may be heated in this way before they are unwrapped. Hence they are kept clean and ready for use, and the extra handling in an oil bath is avoided.

The SHEFFIELD MICRO-FORM GRINDER

With Pantograph and Microscope



Operator feeds grinding wheel toward point marked by cross hairs.

Typical flat and circular form tools possible to produce on Micro-Form Grinder.

FINISH GRINDS PROFILES DIRECT FROM DRAWING

No Templates Nor Masters

- Grinds both circular and flat form tools, templates, profile gages, cams, dies, etc. to accuracy of .0003″.
- Especially suited for grinding cemented carbides and hardened steel.
- Grinding time, especially on intricate profiles, reduced as much as 50-75% compared to other methods.
- Not limited by regularity nor irregularity of work, nor by straight lines, angles or curves.
- Can be used reversely for making layouts from parts having unknown profiles, and for checking parts against layout drawings.

WRITE FOR FULL DETAILS • BULLETIN M-120-143

ARMY E NAVY

SHEFFIELD MASTER CRAFTSMEN

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS—GAGES—MEASURING INSTRUMENTS—CONTRACT SERVICES

Counting on Black &

. . . a Wartime Practice with Postwar Possibilities!

SANDING SHELL of a ship binnacle is just one of many high speed war production "finishing" jobs for Black & Decker Portable Electric Sanders. After Victory is won, these husky Sanders will "finish" the products of peace at this plant, too.

IN NEARLY ALL of the nation's war plants today, men and women are doing their jobs faster and better with the help of Black & Decker Portable Electric Tools. Here are typical examples, showing these tools in action at a midwest war plant, now making binnacles and other equipment for fighting ships.

This plant's time study expert says: "We know from experience what Black & Decker Tools can do for us—that's why we're using them for our war work." Other war manufacturers echo similar comments: "We depend on Black & Decker because we lose no time getting parts and repairs" . . . "Built our entire production around your Drills and Grinders" . . . "Black & Decker speed and accuracy save us time and money."

WOMAN OPERATOR uses a Black & Decker Holgun Drill in Black & Decker Drill Stand on precision drilling operation in binnacle assembly. This Ohio plant uses many types of Black & Decker Drills for all sorts of high-speed assembly jobs.

Such reports as these show why war producers, for whom Black & Decker Tools facilitated the shift to war work, are giving these tools a prominent place in their plans for a quick shift ahead to peacetime production. The completeness of the Black & Decker line, the "know how" of Black & Decker engineers, the coast-to-coast Factory Branch Service facilities, the expert help and tool information available through leading distributors everywhere . . . *these* are reasons why you, too, should keep posted on Black & Decker Tools as part of your postwar planning.

"They Used Their Heads" is the title of an illustrated book showing how ingenious production men have solved perplexing problems with Black & Decker Tools. For your FREE copy of "They Used Their Heads," address: The Black & Decker Mfg. Co., 716 Penna. Ave., Towson-4, Maryland.

DRILLING BINNACLE bracket installation with heavy duty Black & Decker Drill. Black & Decker Portable Electric Tools are used to help many speed the production of vital naval equipment at this busy mid-west war plant.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

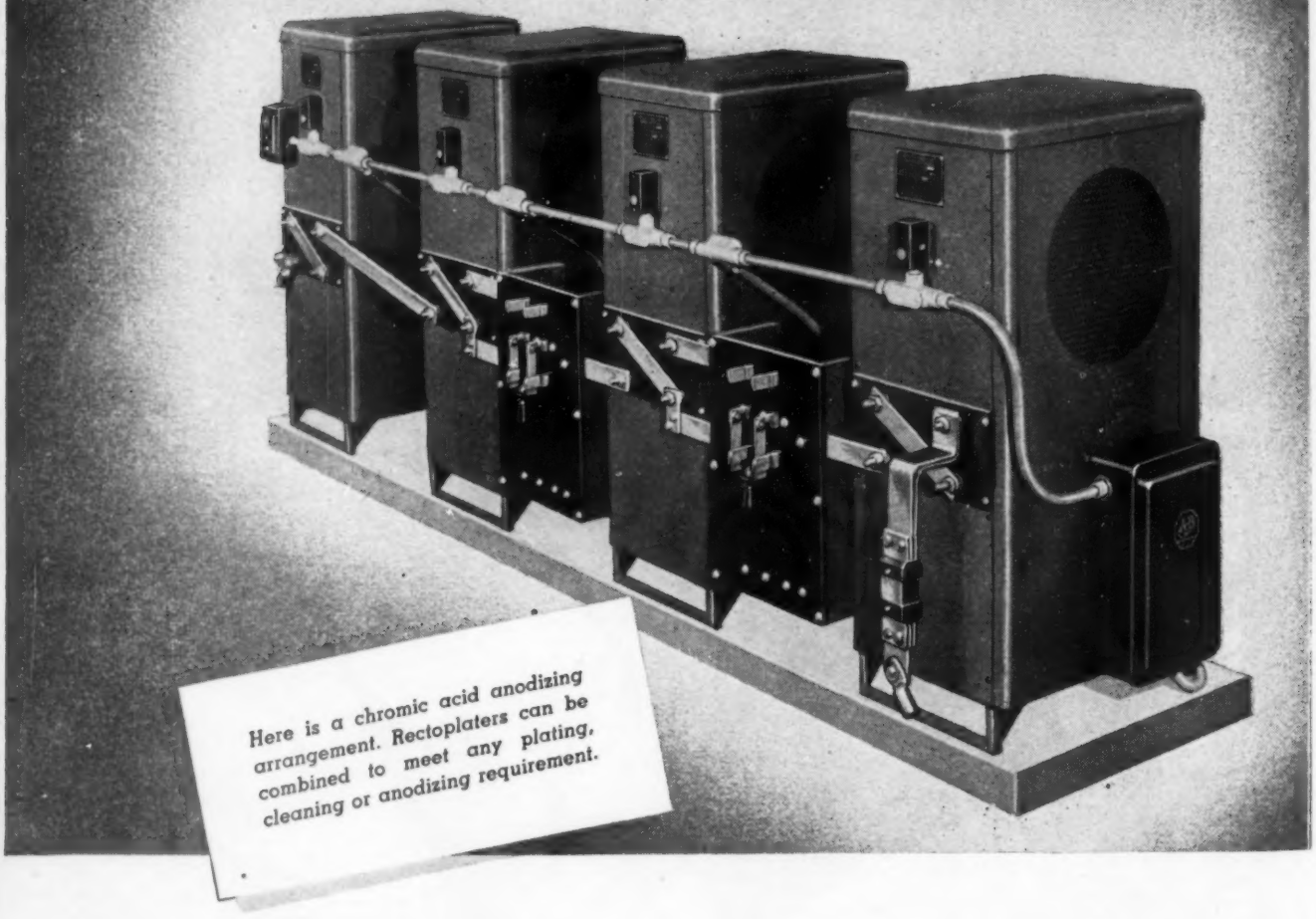
BLACK & DECKER GRINDER here is helping this plant to meet war contract deadlines. Performance of Black & Decker Portable Electric Tools causes the plant's time-study official to comment: "They're the best electric tools on the market."

Decker Tools
Women War Workers!
by the hundreds are needed *now* for essential jobs everywhere. This relatively new employee at a busy Ohio war plant handles her Black & Decker Scrugun with speed and skill . . . "women are doing a good job here" says plant time-study official. If you know any women who are qualified to free men to fight, we suggest you urge them to apply at once to their local United States Employment Office.

Mr. Subcontractor:

YOU'LL BE NEEDING EXTRA AMPERES *FAST*

TO MEET INCREASED PRODUCTION DEMANDS!



Here is a chromic acid anodizing arrangement. Rectoplaters can be combined to meet any plating, cleaning or anodizing requirement.

WHEN you are asked to double your output over night. When the walls of your present quarters already bulge from crowding and expansion is impossible. When you can't possibly squeeze in *more* bulky machinery—and you need those extra amperes *FAST*. THAT'S A JOB FOR UDYLITE-MALLORY RECTOPLATERS.

Rectoplaters are small, compact units, standardized in design and production, tested by years of actual service in plants all over the country. Each unit delivers 1440 amps at 6 volts or 720 amps at 12 volts. They are easily moved wherever needed, require little floor space and no special installation.

Rectoplaters may be used individually or in series when greater amperage is required. They require no conversion for peacetime use.

(RECTOPLATERS ARE IN STOCK FOR IMMEDIATE DELIVERY)

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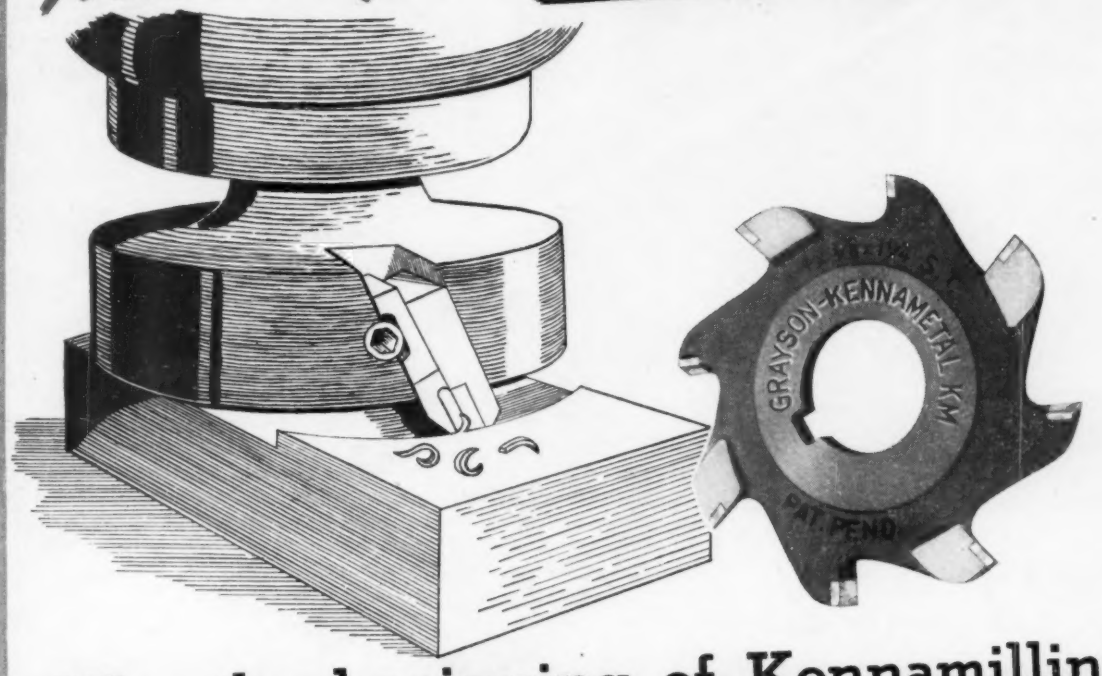
★ SECOND IN A SERIES ★

This simple KENNAMETAL *cutter*



Was the beginning of Kennamilling and a NEW ERA of MILLING STEEL

KENNAMILLING, variously called "Hyper-milling" or "Super-milling", was begun when this simple cutter began to skid chips from hard aircraft steel.

Until 1940 the milling of steel was confined to the slower, high speed steel cutting tools. With the introduction of KENNAMETAL, however, with its inherent transverse rupture strength and non-galling properties, efficient milling of steel became possible. The strength and hardness of KENNAMETAL steel-cutting carbides now have been combined with the rugged Meehanite bodies of GRAYSON milling cutters to form the GRAYSON-KENNAMETAL shock-resistant milling cutters, designed for maximum production on milling operations on all metals.

The cutter illustrated—with only one cutting tool—replaced an eight-flute high speed steel mill, stepped up the cutting speed from 80 rpm to 323 rpm, and increased the table feed per minute from ½" to 3-½".

This single KENNAMETAL cutter produced as many pieces per grind as the eight-flute high speed steel mill, but in only one-seventh the time. During the job, even more time was saved on grinding than on cutting.

KENNAMETAL milling cutters, like KENNAMETAL boring and turning tools, produce more finished parts per machine per day.

Write for information about KENNAMILLING and solve your milling problems.

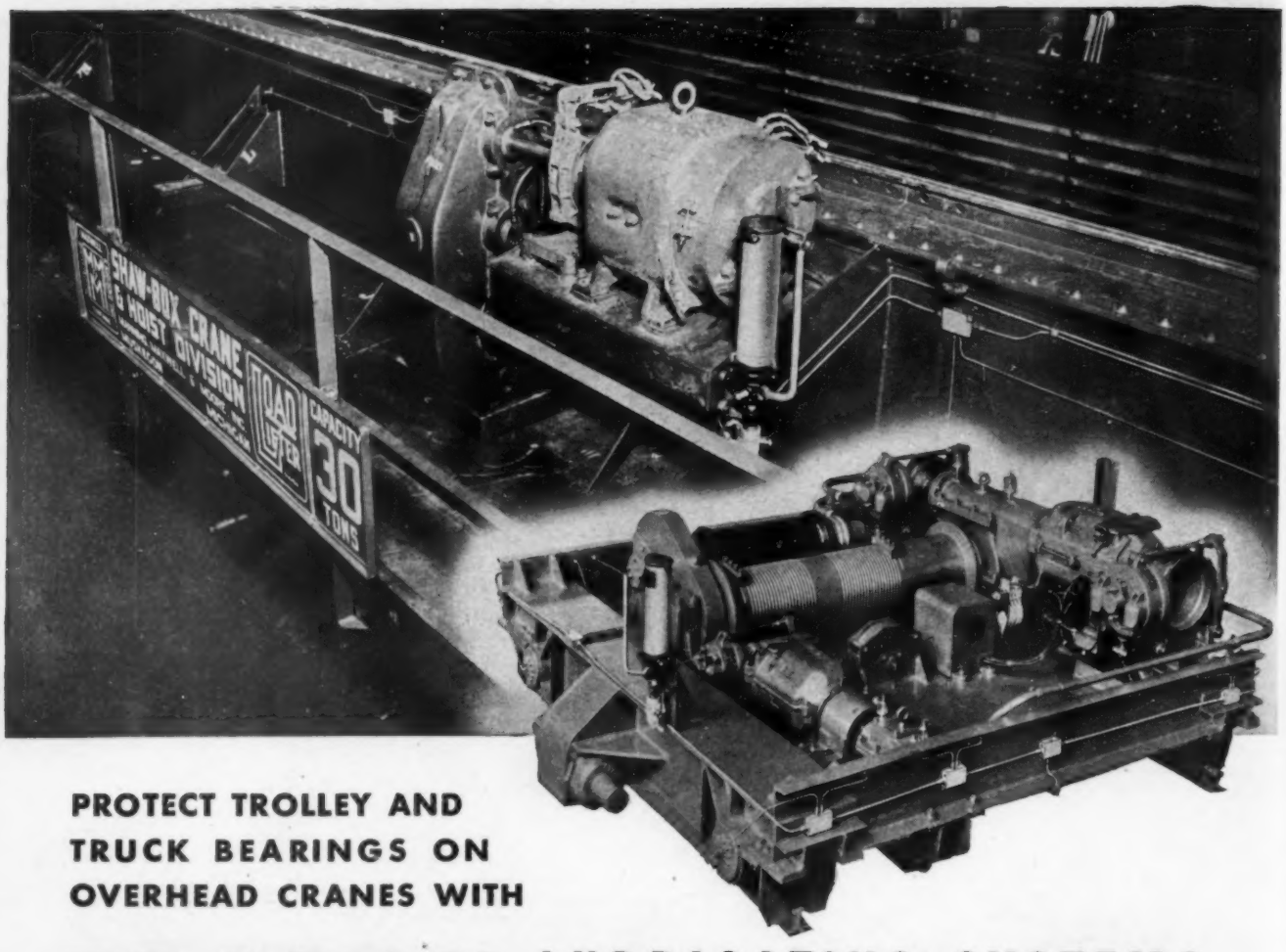
KENNAMETAL *Inc.*

103 LLOYD AVE., LATROBE, PA.

Trade Mark Reg. U. S. Pat. Off.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)

KENNAMETAL THE All American CARBIDE



PROTECT TROLLEY AND TRUCK BEARINGS ON OVERHEAD CRANES WITH

TRABON LUBRICATING SYSTEMS

prevent injuries and tie-ups . . . get longer, more dependable bearing life

"Striking the floor with a sickening thud, a crane operator in Buffalo met sudden death a short time ago. He'd been lubricating his crane — a routine operation — slipped and fell — leaving a grief-stricken family — and more than $18,000 compensation charges."

These accidents are unnecessary! That $18,000 would have equipped 8 to 10 cranes with automatic lubrication—and saved the man's life—because Trabon lubrication makes absolutely certain that every connected bearing, whether large or small, moving or stationary, receives just the desired amount of lubricant, *while the machine is running.* Trabon avoids costly downtime while a man crawls around lubricating each bearing individually.— the breakdown if he misses one,— the lost time, and costs, of accidents,— makes the bearings last longer.

On overhead traveling cranes, costly steel mill equipment, forging presses, brakes, shears, crushers, *and other machines and machinery of all kinds,* Trabon lubrication for years has been meeting every operating requirement. More complete details—including engineering bulletins of interest to every works manager, designer, operating and maintenance superintendent—furnished gladly—no obligation. Write for Bulletins today.

TRABON

ENGINEERING CORPORATION

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INDUSTRIAL LUBRICATION EXCLUSIVELY SINCE 1922

STUDENT WELDERS
LEARN PROPER FLAME ADJUSTMENT FASTER

Oxyacetylene flame adjustments*
Acetylene burning in air
Strongly Carburizing Flame
Slight Excess Acetylene Flame
Neutral Flame
Oxidizing Flame
These natural color photographs will give the student an accurate guide for adjusting the oxyacetylene flame. Correct flame adjustment is so vital to successful welding that the best manipulative skill is lost unless the flame adjustment is correct.
AIR REDUCTION

with this natural color oxyacetylene flame adjustment chart

Student welders and "beginners" learn to make correct flame adjustments more quickly when they are guided by an Airco oxyacetylene flame-color chart. This helpful chart shows full color illustrations of the principal flames used for welding metals.

It makes it easier for the beginner to make sound, strong welds by clearly showing the appearance of the neutral flame which he will use most frequently in oxyacetylene welding. The excess acetylene flame is also shown, as well as the oxidizing flame used for welding copper and copper alloys.

Since the first requisite to good welds is correct flame adjustment, every student welder will benefit by using this flame chart as his guide.

We will be glad to send you, without charge, as many copies of this chart as you need. Mail coupon and please indicate quantity you require.

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IDLE CYLINDERS ARE PRODUCTION SLACKERS: KEEP 'EM ROLLING FOR VICTORY!

Thanks to the

SUNNEN PRECISION HONING MACHINE

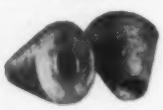
GIRLS IN 'TEENS

are handling jobs in "tenths"!

Aluminum Aircraft Link "produces high finish without bell-mouthing."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

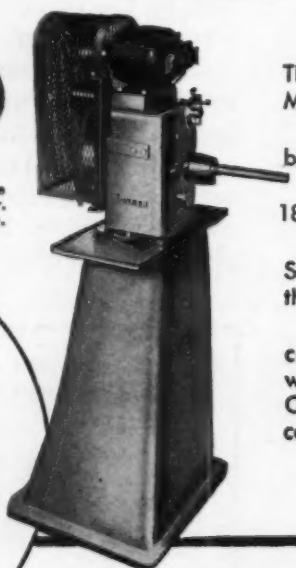
Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Aircraft Valve Tappet Roller. 4-Micro finish.

and what's more remarkable, they can be trained for such accurate work in a few hours.

That's only one reason manufacturers of combat equipment and munitions have adopted the SUNNEN Precision Honing Machine.

The guaranteed accuracy (.0001") and super-smooth finish (2 to 3 micro inches) assure fewer rejects and interchangeability of parts. These advantages not only speed production, but prevent waste of vital war materials.



Low in Cost—Economical to Operate

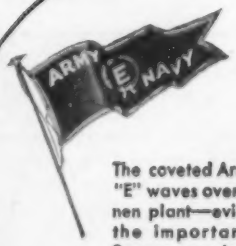
The basic price of the Sunnen Precision Honing Machine is only $195! And it's economical to operate.

No jigs or fixtures—work is held in hands. Relieves big internal grinders for other jobs.

Wide range—handles any internal diameter from 185" to 2.625".

Protect your previous operations by using the Sunnen method for that most important operation—the last one.

It's easy to find out just what Sunnen equipment can do for you on your job—one of our engineers will be glad to call and help you solve your problems. Or—if you prefer—write for free bulletin giving complete information.

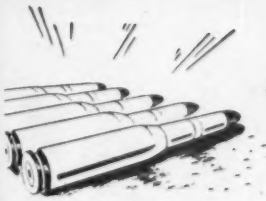


The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY, 7941 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario



Bullets BY THE Billion

THIS SPECTACULAR anti-aircraft fire, above a city near the battle front, presents a graphic picture of our Armed Forces' expenditure of bullets literally by the billion . . . and brings home to all the need for faster and more efficient machining.

In getting the most out of machine tools and cutters, drills, reamers, boring bars, grinding wheels, etc. in producing not only bullets, but guns, planes, tanks, ships and countless other weapons, plants everywhere are using *Texaco Cutting* and *Soluble Oils.*

Texaco Cutting Oils, for example, lubricate tools, carry away the heat and prevent chip welding. Their use assures improved surface finish and maximum output per tool grind.

So effective have Texaco lubricants proved that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the correct grades of *Sultex, Transultex, Cleartex, Almag, Britex* or *Soluble Oils* for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

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The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THEY PREFER TEXACO

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

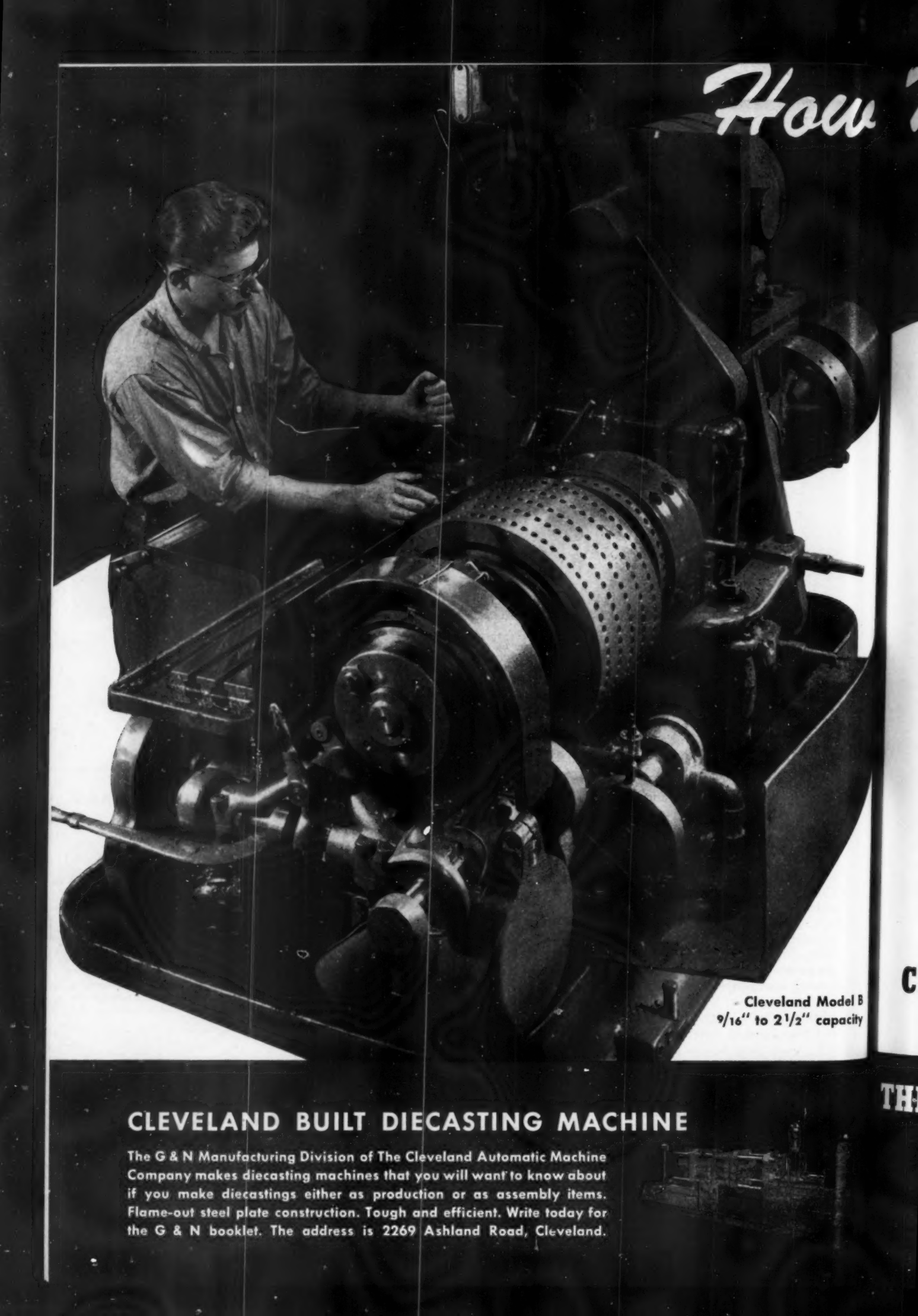
★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT – CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY



Cleveland Model B
9/16" to 2 1/2" capacity

CLEVELAND BUILT DIECASTING MACHINE

The G & N Manufacturing Division of The Cleveland Automatic Machine Company makes diecasting machines that you will want to know about if you make diecastings either as production or as assembly items. Flame-out steel plate construction. Tough and efficient. Write today for the G & N booklet. The address is 2269 Ashland Road, Cleveland.

...w Many More Pieces per Shift?

CLEVELAND Single Spindle Automatics always have taken a place at the head of the class on the question of economical production. Of course this question is as old as the machine tool industry, and you can get as many answers as there are machine tool makers. But . . .

What you want to know, in the last analysis, is . . ."how many more pieces do we get per shift, and per unit of cost?"

Cleveland engineers can show you the best kind of evidence. There are clear-cut case histories of Cleveland savings in time and cost, for every kind of manufacture. Some of these are on parts involving problems very close to yours. What is even more to the point, if you say the word, these engineers will make a study, without obligation on your part, to show how savings can be made in your plant, on your current production.

It has paid others to look into this question thoroughly. They specified . . .

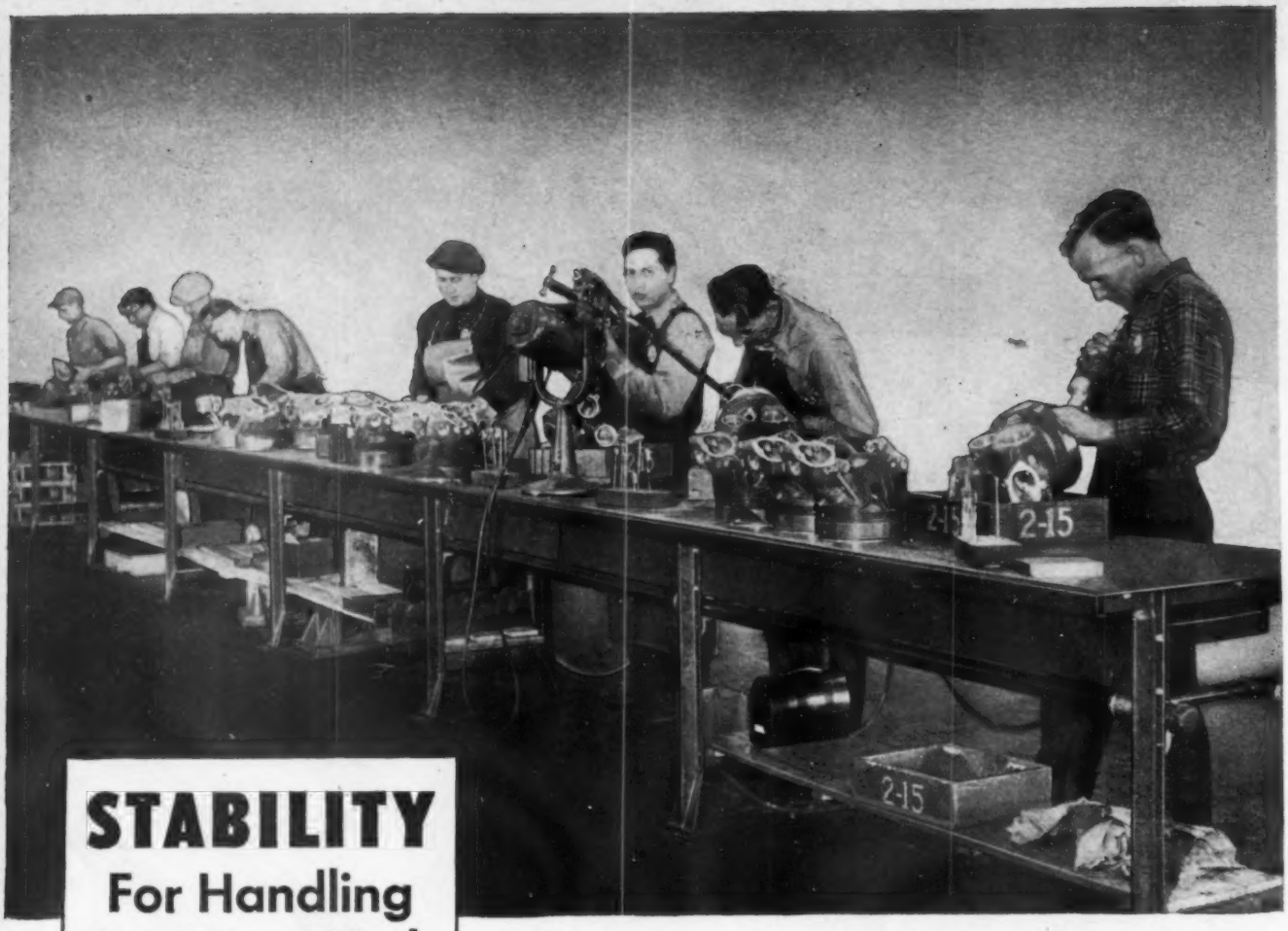
CLEVELAND *Single Spindle* AUTOMATICS

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

SALES OFFICES

CHICAGO: 1408 Civic Opera Building
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Building
CINCINNATI: 1315 American Building



STABILITY
For Handling Precision Work

Here "Hallowell" Work-Benches of Steel have been used because their stability and uniformity make them ideally suited for the job. The bench legs are flanged and ribbed and to make their stance firmer still flanged stringers tie each set of legs together into an extremely rigid structural unit.

"Hallowell" Work-Benches are perfectly adapted, for assembly, testing, packing, wrapping and manifold other functions and they come in a wide variety of ready-made combinations. Moreover, they can be joined end to end, used singly, or formed into handy functional units. They are available with drawers, shelves, or whatever other special equipment is needed . . . Why not send for the "Hallowell" Catalog to help you plan, then let us know your needs?

Duration Type
"HALLOWELL" WORK-BENCH OF WOOD

for use where steel work-benches are prohibited by wartime restrictions. Large selection available. Write for Bulletin 577.

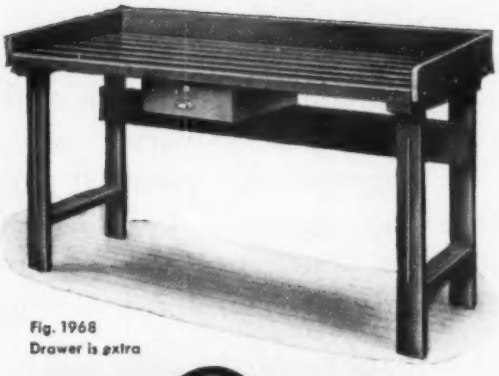


Fig. 1968
Drawer is extra

Fig. 1927
Pat's Pend.

HALLOWELL

SHOP EQUIPMENT
"HALLOWELL" WOOD STOOL

Another wartime product. Sturdily constructed, of selected hardwood. Various sizes, with or without backs. Send for Bulletin 575.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

5 ways to attach high-speed tips to plain steel shanks

Now that it is necessary to conserve every ounce of strategic alloy elements, many tool-steel users are tipping their tools with high-speed steel, instead of using this scarce material for the entire body of the tool. Here is a detailed tabulation of five ways to tip a plain steel shank with a high-speed tip.

METHOD	1. Low Temperature Brazing or Silver Soldering	2. High Temperature Brazing	3. Fusion Cementing	4. Resistance Butt or Flash Welding
Equipment needed	(1) Heating torch or furnace. (2) Clamp for holding tip in position.	(1) Brazing furnace (Controlled atmosphere).	(1) Heating furnace. (2) Press or machine such as a drill sharpener equipped with special dies.	(1) Resistance butt welding machine. (2) Preheat furnace. (3) Slow-cool facilities.
Correct heat-treatment and shaping of tip	(1) Previously hardened and tempered. (2) Ground or machined to semi-finished size and to fit recess in shank.	(1) Annealed. (2) Ground or machined to semi-finished size and to fit recess in shank.	(1) Annealed. (2) Ground or machined to semi-finished size and to fit recess in shank.	(1) Annealed. (2) Rough cut or machined to fit shank. It is not necessary to recess shank.
Preparation of tip and recess of shank	Washed with carbon-tetrachloride or gasoline to remove grease and dirt.	Same as 1.	Copper coated in solution of copper sulphate or washed with boric acid solution.	None.
Flux	Prepared flux of low melting temperature, sold by various firms.	Borax.	None.	None.
Bonding material	Silver solder ribbon.	Copper foil.	Use one of the popular fusion cements now on the market.	None.
Temperature of operation	Below maximum draw temperature of high-speed steel tip.	At optimum quenching temperature of high-speed steel tip.	Same as 2.	Welding heat confined to surface of tip and shank to be welded.
Cooling after bonding	Air cooled	Quenched in still air, air blast or oil from brazing heat.	Same as 2.	Slow cooled after welding.
Subsequent shaping and heat-treatment	(1) No heat-treatment. (2) Tool may be ground to finished shape.	(1) Tempered to develop best cutting properties in tip. (2) Tool ground to finished shape.	Same as 2.	(1) Tool may be rough shaped to finished size by forging and/or machining. (2) Quenched and tempered to develop optimum cutting properties. (3) Tool ground to finished shape.

5.

A fifth method of tipping is by electric-arc welding. This is essentially similar to that outlined above under resistance butt or flash welding. The only differences are that you use an electric-arc machine, bevel the edge of the tip and of the shank in preparation for welding, and use 18-8 stainless steel as a bonding material. Preheating and slow-cooling are necessary to produce a satisfactory tool.

Still another way of tipping is of course the long-established mechanical method—simply design a suitable recess in the shank and fasten the tip in place by a set screw or a bolt.

If you have a specific problem on "tipping," write to Bethlehem Steel Company, Bethlehem, Pa. We will be glad to give you help and advice without obligation on your part.

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Faster Since They Started Finishing Them With the

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LEMPCO-EVANS REAMER

They used to finish 33 gas cylinders per hour to +.000"-.0005" tolerances. Now, with Lempco-Evans Hi-Speed Steel Reamers, 133 gas cylinders are finished per hour. Furthermore, the excessive and costly wear on the plug gauges, caused by abrasive left in the holes, has been completely eliminated. A minimum of 1000 pieces are reamed before the removable blade segments require resharpening, which is done easily and economically. If you finish holes in aluminum, bronze, iron, steel, or nickel alloys, it will likely pay you to switch to Lempco-Evans Reamers.

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Only THE LEMPCO-EVANS REAMER OFFERS YOU *All* THESE ADVANTAGES:

- Finishes within .0001"
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- Produces Chrome-like Bearing Surface
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- Straight Line Expansion from .050" to .080" (Sizes under 11/16" slightly less)
- Right and left spiral blades, shearing in opposite directions simultaneously, ream smoothly over keyways, oil grooves, slots and split bushings.

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EVERY plant has some one toughest drilling job—where breakage is high—production is interrupted—and costs are out of line.

There's the place where we want you to test Standard Red Shield Drills. It is on these tough jobs that their superiority is most evident.

Sixty-two years of concentrating on one principle—the finest tools skill can make—with absolute uniformity in performance—enable us to make this unusual request.

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Blacksmith Drill. No. 517—High Speed Steel. No. 112—Carbon Steel
Standard Taper Shank Drill No. 550—High Speed Steel. No. 104—Carbon Steel.
Stove Burner Drill—Round Shank. No. 528—High Speed Steel. No. 368—Carbon Steel.
Oil Hole Drill. No. 510—High Speed Steel.
3 Flute Drill. No. 511—High Speed Steel.
Oil Hole Drill. No. 509—High Speed Steel.
Slow Spiral Drill for Bakelite, etc. No. 5068—High Speed Steel.
Letter Size Drill No. 505—High Speed Steel. No. 106—Carbon Steel
Jobbers' Drill. No. 504—High Speed Steel. No. 105—Carbon Steel.
4 Flute Drill. No. 512—High Speed Steel.
Subland Drill. No. 551—High Speed Steel.
Wire Gauge Drill. No. 506—High Speed Steel. No. 107—Carbon Steel.
Left-Hand Jobber Drill. No. 504L—High Speed Steel No. 105L—Carbon Steel

RED Shield Brand Drills are absolutely uniform in construction and performance. Our engineers will gladly recommend drills, reamers, and cutters that give maximum production in your metal-cutting work.

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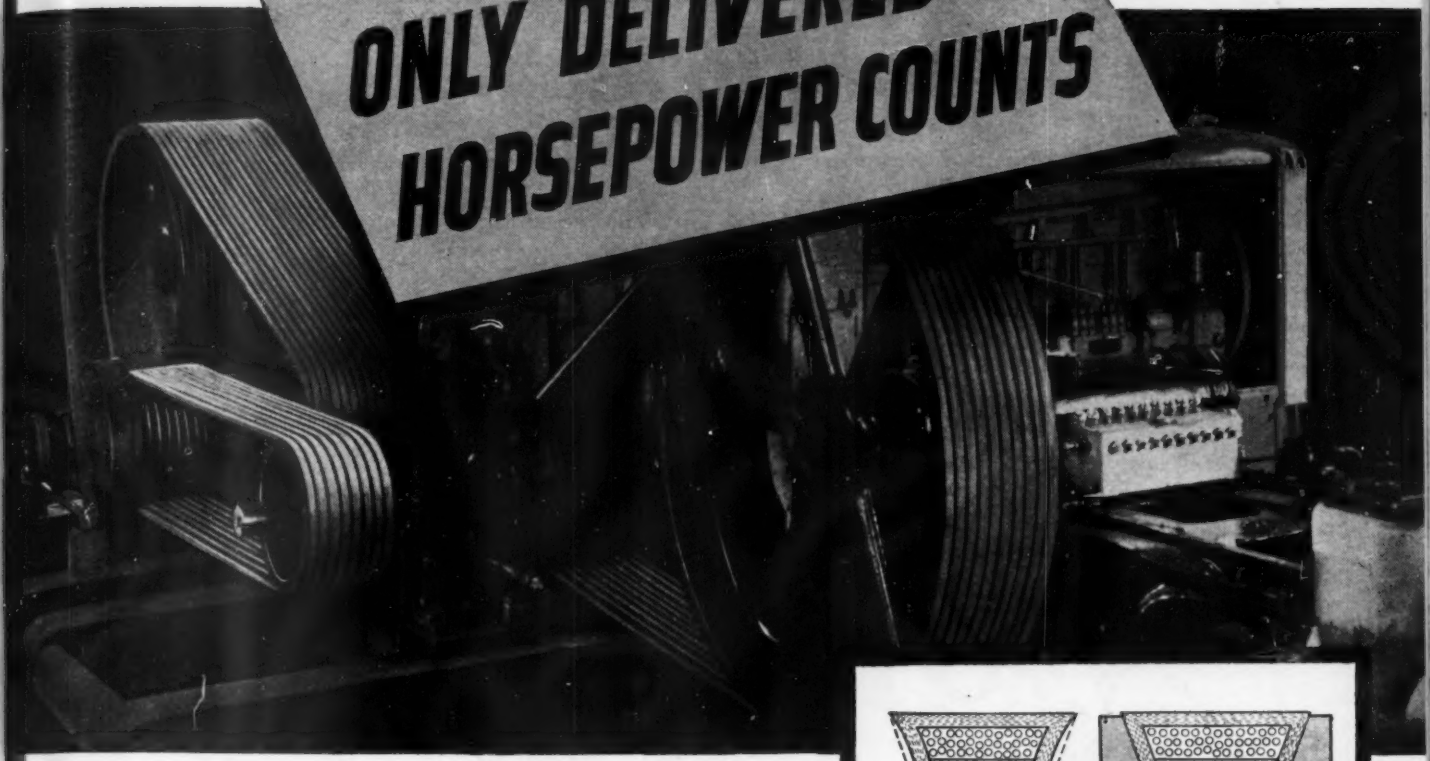
ONLY DELIVERED HORSEPOWER COUNTS



When you hook up your motors to production machines with Matched-Quality D-V Drives you deliver a knock-out punch to "power absenteeism." You are putting *all* the power into production for stronger Victory drives on battle fronts.

A well engineered team, Dodge D-V Belts and D-V Sheaves go "all out" *together*. Their matched-quality construction puts *all* the power to work. Special tooling and precision gauges insure uniform accuracy. Each D-V *Sheave* is precision-grooved to insure proper seating of each belt. With D-V Matched-Quality drives you are sure of:

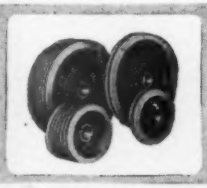
✓ Uniform seating of each individual D-V Belt . . . ✓ no sag, slip or uneven belt pull . . . ✓ every individual D-V Belt does its full share of the work . . . ✓ less wear on belts, sheaves and other transmission parts, thus conserving critical materials and reducing operating costs.

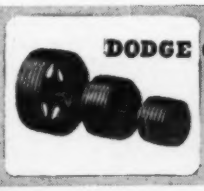
Dodge D-V Drives assure clean, silent, low-cost operation. ✓ No lubrication required . . . ✓ no danger of oil damage to product . . . ✓ no adjustments required . . . ✓ maintenance is reduced to a minimum . . . ✓ peak power transmission efficiency and economy are certain!

In the complete line of Dodge D-V Drives, bearings, clutches, pulleys and other modern power transmission units, your local Dodge Distributor offers "The Right Drive for Every Job." Contact him . . . he is prepared to render valuable service . . . or write to

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U. S. A.

DODGE VICTORY WOOD *Matched* **D-V SHEAVES**





DODGE CAST IRON PRECISION *Matched* **D-V SHEAVES**

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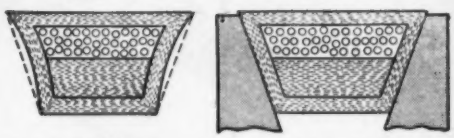
THROW ALL YOUR SCRAP INTO THE FIGHT! BUY MORE WAR BONDS!

THE RIGHT DRIVE FOR EVERY JOB



Dodge D-V Belts have concave sidewalls. When flexing around sheave, the sidewalls flatten out straight, thus providing full contact between the V-Belt sides and the sheave groove. This insures even pull, eliminates slippage, prevents power-loss.

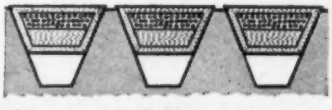
★

Belts with flat sidewalls will bulge in center when flexing around sheave, thus making only partial contact with the sides of the sheave groove.

★

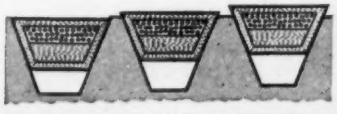
IMPORTANT NOTE: It takes D-V Sheaves and D-V Belts to give you a Dodge "Matched-Quality" D-V Drive.

GET THIS

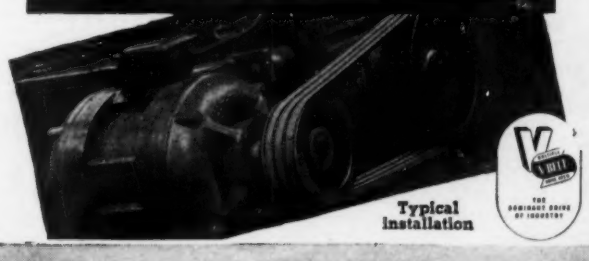


Precision machining of D-V Sheaves insures smooth grooves of uniform pitch diameter which means long belt life, accurate seating of belts, even pull, full power delivered to work.

NOT THIS



This is what happens when sheave dimensions are not uniform. Belts can't seat properly and pull unevenly. Loafing belts mean lost power, shorter belt life.



Typical installation

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"PUT ON THE PRESSURE AND SPOIL THE FILE," SAYS POP

DO I SMELL SMOKE... OR IS THAT JUST POP SCALDING TH' SHOP BOOB WITH A LOOK FOR TH' WAY HE'S LAYIN' INTO THAT FILE?
GARGANTUAS LIKE HIM COME EQUIPPED WITH MUSCLES OF STEEL AN' BRAINS OF SOUP!...
THERE MUST BE SOME EASIER WAY TA RUIN A FILE THAN THAT...
SOME GUYS ARE SO DUMB THEY EVEN GOT TA FIND A HARDER WAY TA DO THINGS WRONG!
ALEXANDER

UNAVOIDABLE as they are, wastes on the battle fronts are terrific. They make it all the more necessary to *prevent* wastes on the home fronts. In order that every possible ton of steel may become available for implements of war, every possible pound of steel must be saved by stretching the serviceability of the tools required to build them.

In no other shop tools can there be a heavier percentage of steel wastage through *mis*use than in files. Nor more serviceable life added by *proper* use, proper care and proper selection of *The right file for the job.*

Too much hand pressure is the commonest filing fault. Consequently, too much "pressure" can scarcely be exerted by foremen toward keeping workmen out of this wasteful habit.

The superior cutting and lasting qualities built into Nicholson and Black Diamond Files will prove that it pays to specify these world-famous brands. To help bring out the proof, Nicholson offers industrial managements this really useful book:

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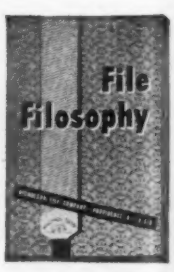
The most authoritative book of its kind! Understandably written and profusely illustrated, "File Filosophy" is a most valuable handbook. It describes the more widely used regular and special purpose files, and is particularly helpful in training the less-experienced worker in proper file use, care and selection. Available for the asking—for purchasing and production heads, foremen, key mechanics.



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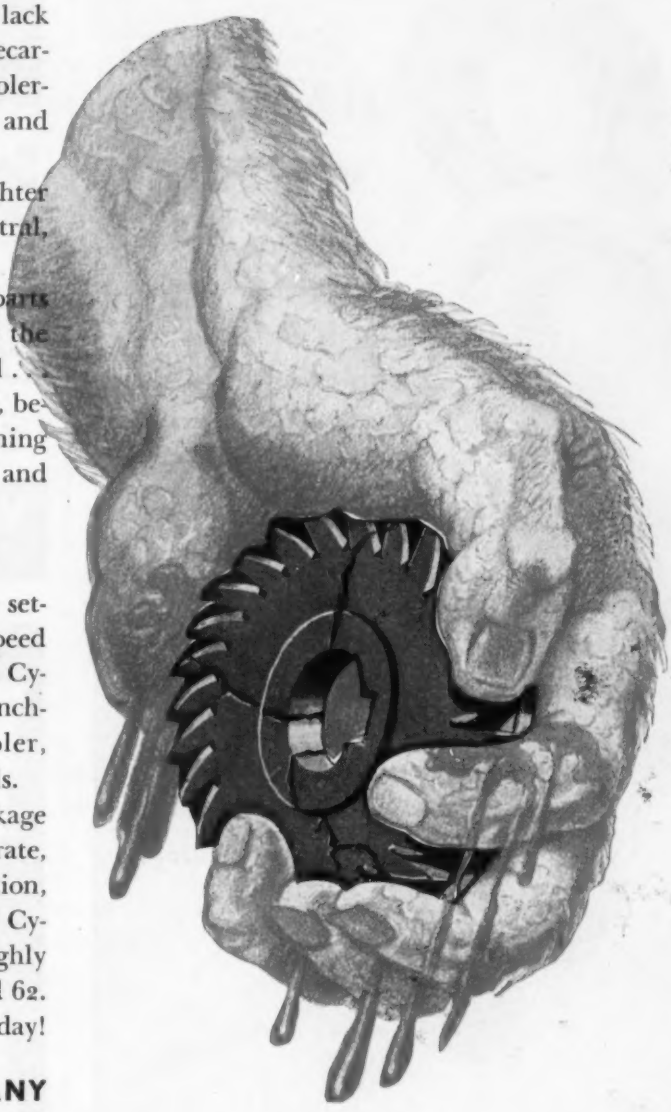
Is *Murder* being plotted in your toolroom heat treat department?

OFTTIMES the death of a tool or die is unwittingly plotted in the sweat and flame of the heat treating department. Scale kills the tool for lack of uniform hardness. The "soft skin" of decarburization robs the surface of necessary tolerances. Carburization leads to fatigue cracks and part failure.

You *can* put a stop to the unnecessary slaughter of tools and dies. You can do it with the neutral, controlled atmosphere of Hydryzing.

The clean uniform hardness of Hydryzed parts insures the precision planning you put into the job . . . it justifies the careful selection of steel . . . enhances the craftsmanship of the toolmaker, besides saving you the expense of costly cleaning operations such as sandblasting, pickling and polishing.



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LINDBERG can supply a complete toolroom setup, including a preheat furnace, high speed furnace (both with Hydryzing atmosphere), a Cyclone Toolroom Tempering Furnace, and quenching equipment complete with tank, cooler, circulating pump, and temperature controls.

Lindberg toolroom heat treating in a package gives you clean, uniform hardness with accurate, low-cost tempering. The advantages, operation, sizes, and types of Hydryzing hardening and Cyclone tempering furnaces are more thoroughly explained and illustrated in Bulletins 94 and 62. Insure your tool and die production. Write today!

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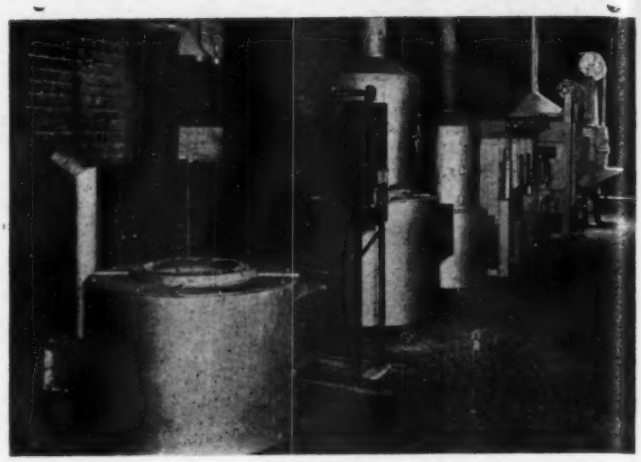

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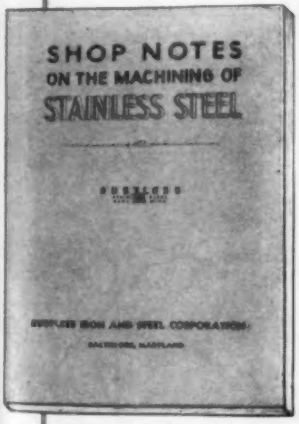

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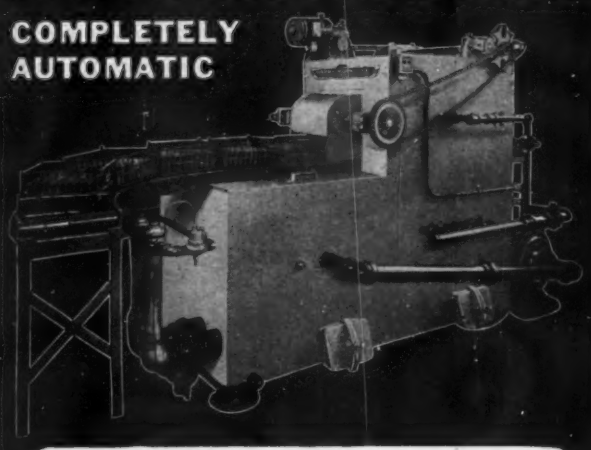

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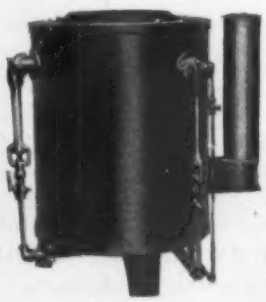
Atmospheric Pot Hardening Furnace



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. . . are the efficient, economical answer to today's Heat Treating Problems. *NO BLOWER or OTHER AUXILIARY POWER are needed . . . just connect to your gas supply.*

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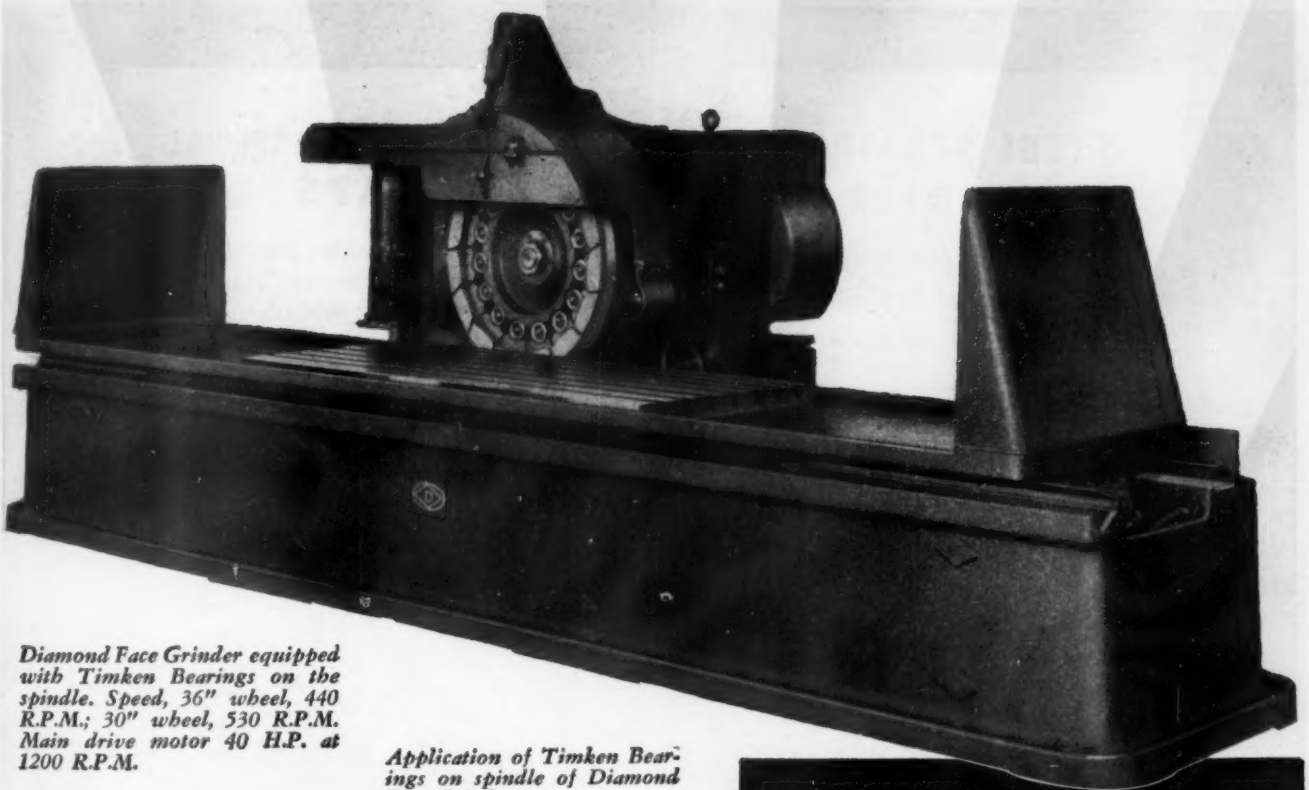
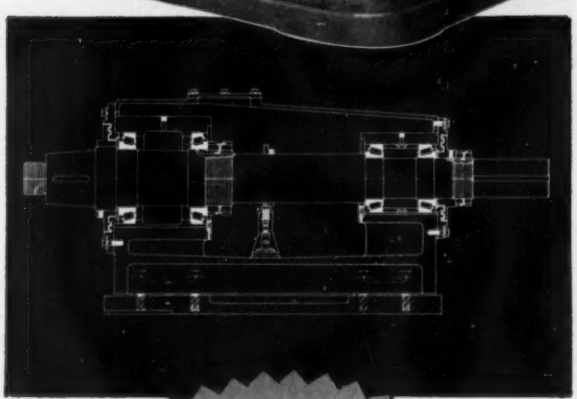
Full Muffle Furnace

Perfect face grinding with the wheel spindle on Timken Bearings



Diamond Face Grinder equipped with Timken Bearings on the spindle. Speed, 36" wheel, 440 R.P.M.; 30" wheel, 530 R.P.M. Main drive motor 40 H.P. at 1200 R.P.M.



Application of Timken Bearings on spindle of Diamond Face Grinder.

It takes a rigid spindle to hold a 36 inch face grinding wheel in such accurate alignment that perfect contact between wheel and work is maintained under all conditions. The slightest wobble or chatter effect would render good results impossible.

A typical example of the tremendous rigidity obtainable by the use of Timken Tapered Roller Bearings is seen in the spindle construction employed in the Diamond Face Grinder, product of the Diamond Machine Company of Philadelphia.

Besides assuring a rigid, chatter-free spindle, Timken Bearings produce ultra smooth operation with minimum power consumption; and carry all radial, thrust and combined loads safely. With Timken Bearings on the spindles of lathes, milling machines, drilling machines, and grinding machines you are assured of maximum production with fewer rejects. Make sure you have them on your machine spindles. The Timken Roller Bearing Company, Canton, Ohio.

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Get ready to meet post-victory competition. Redesign your equipment for better performance and use more Timken Bearings.

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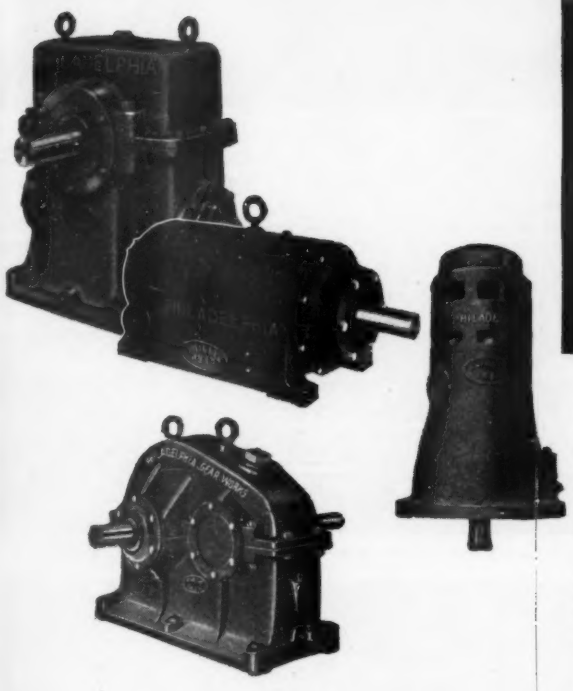

Shown here are a Philadelphia Worm Gear Reducer, a Herringbone Gear Reducer, a Vertical and a Horizontal type MotoReduceR.

Philadelphia engineers can recommend the correct type of speed reducer for transmitting power to your machines because the complete line of Philadelphia Speed Reducers includes all types . . . *and they are all made in a wide variety of horsepowers and reduction ratios.* Philadelphia units are designed to combine dependability with efficiency and economy. Their long standing record of trouble-free operation is another good reason for choosing Philadelphia these days when Production without interruption is the goal of all American industry. Tell us your problem.

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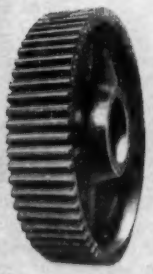
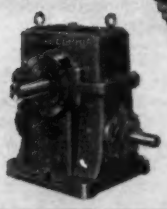


Philadelphia **GEARS** All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia **HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia **MOTOREDUCER** The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.



Philadelphia **WORM GEAR SPEED REDUCER** right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

"Know-How" BASED ON LONG EXPERIENCE MEANS PROMPT DELIVERIES ON

SIER-BATH

PRECISION GEARS TO YOUR SPECIFICATIONS

Long experience of the "men behind the machines" in the modern SIER-BATH GEAR plant plus the new highly specialized gear-manufacturing equipment itself contribute to SIER-BATH'S ability to produce precision gears of highest quality in shortest possible time. With proper priorities reasonably short deliveries can be made on gears from 2" to 52" diameter.

Your inquiries will have immediate attention. Send us your specifications.

The Doorway to 38 years experience in making Precision Gears

SIER-BATH GEAR CO.
NORTH BERGEN NEW JERSEY
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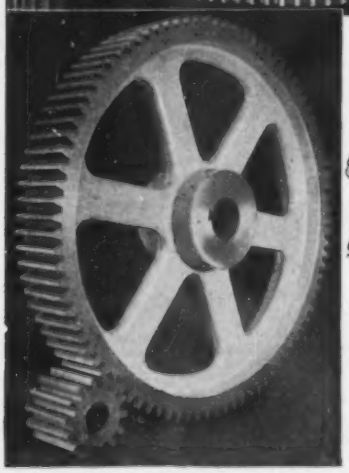


We're Proud OF THIS JOB!

. . and why not?

It's not only a big one but the specifications called for close tolerances for gears of this size. And Stahl met every requirement well within the limits called for.

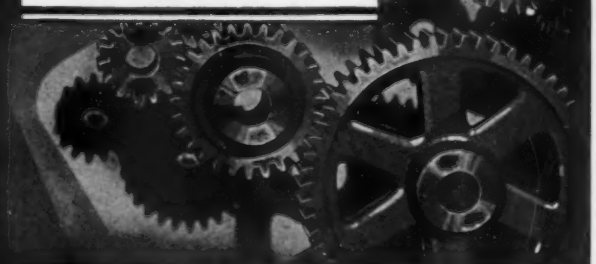
Whether it's big jobs or small ones, Stahl is equipped by experience, equipment and every modern gear making facility to render prompt, efficient, economical service in producing gears of all kinds in any quantity.

Come to Stahl for *your* gear needs and you'll be proud of the job we turn out for you. Send Stahl your specifications.

THE STAHL GEAR & MACHINE CO.
3901 Hamilton Ave. Cleveland, Ohio

"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears —Reduction Units—Why not try GRANT.

You will find GRANT service meeting all requirements on both stock and special gears."



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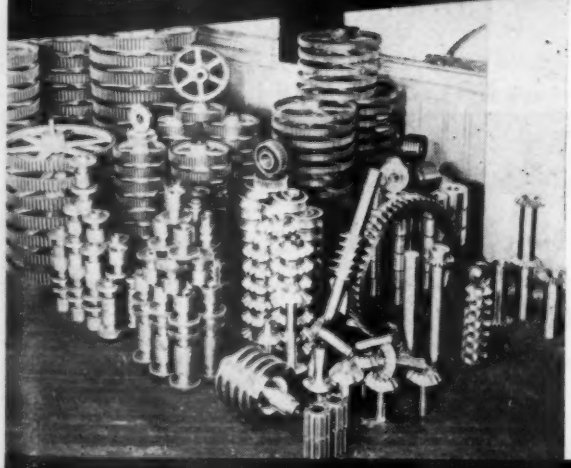
ATLANTIC *Custom-Cut and Stock Gears*

QUICK AND EFFICIENT GEAR SERVICE ON A WIDE VARIETY OF TYPES SIZES . . . . .



★

The illustration shows one of three large hobbing machines in our plant, completing a Herringbone Gear 23° helix angle, 4 pitch AGMA standard form, with 1" width of groove, of one solid casting.

This type of gear has the advantage of smoother running action over spur gears, and the further advantage of absence of side thrust over single helical gears. The narrow 1" groove in the center eliminates the creation of oil-pockets, a feature of design which results in greater efficiency.

Our widely assorted gear production equipment includes gear hobbers, single cutters, shaping and generating machines to handle simple or intricate work from 1/4" dia. 48 D.P. up to 60" dia., 2 1/2" D.P. Gears complete — for cutting your own blanks.

★

Call on Atlantic for Spur — Spiral — Single or Double Helical Gears — Worms and Worm Gears, Sprockets — Bevel Gears, etc., in any material — cut to your specifications for repair work — for standard gears from our extensive stock.

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Write for your copy of our Hand Pocket Catalog.

ATLANTIC GEAR WKS., INC. 200 LAFAYETTE ST., NEW YORK 13, N. Y.

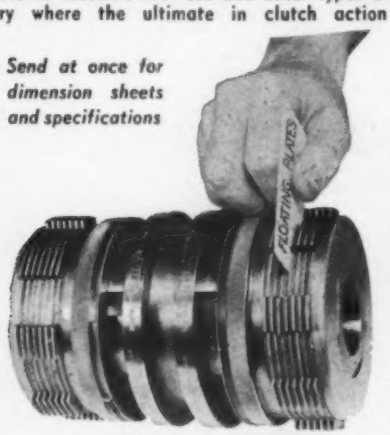
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

Single

THE NEW "MAXITORQ" IS IDEAL FOR MACHINE TOOL APPLICATIONS

"MAXITORQ" FLOATING TYPE MULTI-DISC CLUTCHES are recommended for power transmission applications where smooth engagement, quietness, cool running without drag and quick, positive disengagement are required. They are especially adaptable to machine tool use and other types of industrial machinery where the ultimate in clutch action is of paramount importance.

Send at once for dimension sheets and specifications



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Features include floating discs which assure minimum drag, easy manual assembly and quick easy adjustment. They are compact, simple and require minimum attention. Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 91 OR CONSULT SWEET'S OR THOMAS' REG.

THE JOHNSON FRICTION CLUTCH

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
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CHICAGO

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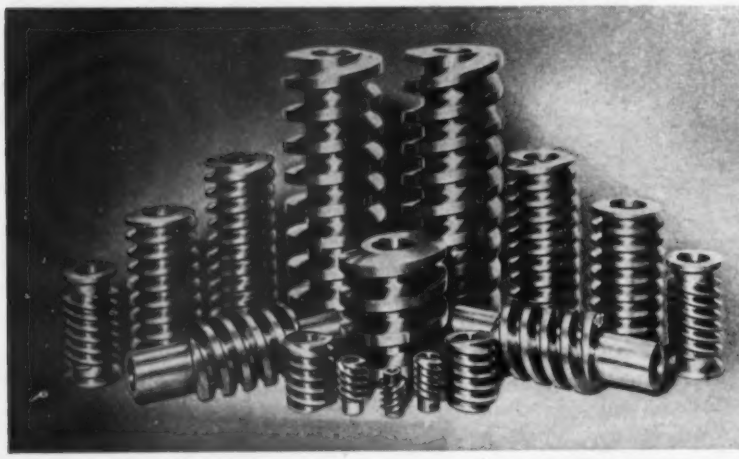

ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
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"HARTFORD"
GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS
When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.
Send specifications—ask for quotations.
THE HARTFORD SPECIAL MACHINERY COMPANY
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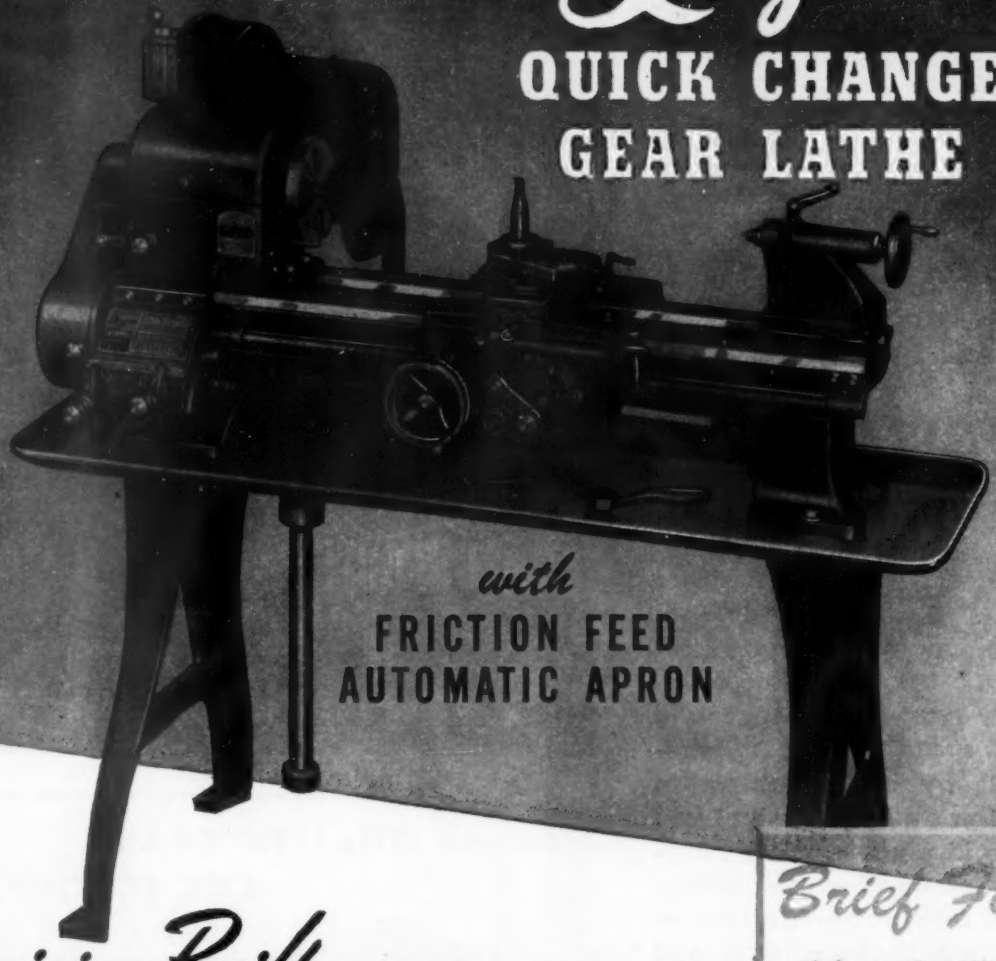
It's New... Logan

QUICK CHANGE GEAR LATHE



with

FRICTION FEED AUTOMATIC APRON

Precision Built FOR SUSTAINED ACCURACY

The variety of work it handles... the speed, accuracy, and safety of its operation place this new lathe in a class by itself. It combines compactness, economy and versatility. With its friction feed automatic apron and precise construction throughout, this new Logan Quick Change Gear Lathe is by every standard a rugged, highly adaptable machine of sustained accuracy. Bed ways, for example, are precision ground to within .001" of absolute accuracy. Total run out of the headstock spindle 12 inches from the bearing is less than .001". The lead screw is held to within .002" in 12 inches. All moving parts are protected by ball bearings or by self-lubricating bronze bearings. As for economy, the new Logan No. 820 quickly pays for itself through lowered unit costs.

LOGAN ENGINEERING COMPANY · Chicago, Illinois

Brief Facts

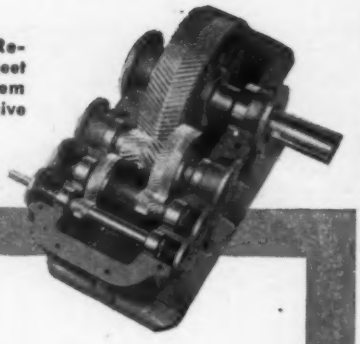
- **Swing over bed 10½"**
- **Bed length 43⅛"**
- **Spindle hole 25/32"**
- **Precision ground ways: 2 prismatic "V" ways; 2 flat ways**
- **12 spindle speeds—30 to 1450 per minute**
- **Worm drive from lead screw spindle for power feeds**
- **Friction clutch on power feeds**
- **Longitudinal feed .0015 to .1000" per spindle revolution**
- **Cross feed .25 times longitudinal feed**
- **Half nut drive from lead screw thread for thread cutting**

Threads—48 selections RH or LH—4 to 224 per inch

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

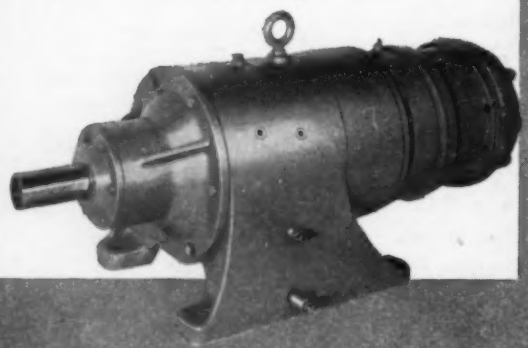
D.O.James Gear Speed Reducers are produced to meet any Power Saving Problem and are made in an extensive range of sizes and ratios.



the obligations and opportunities of tomorrow!

ARMY E NAVY

The experience derived from the successful handling of industry's vast war-time gear and gear speed reducer requirements by our organization gives us an initiative that will prove invaluable to our capability of meeting the obligations and opportunities of industry's post-war gear and gear reducer requirements.



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D.O.JAMES MANUFACTURING CO.

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MAKING ALL TYPES OF GEARS AND GEAR REDUCERS

PRECISION GEARS

AS SMALL AS 5/16" ARE BEING PRODUCED BY DETROIT BEVEL GEAR

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Gears of all types are manufactured exactly to your specifications in sizes up to 16".

Supplied in any desired Material

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MP QUALITY GEARS CUT TO ORDER MP

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

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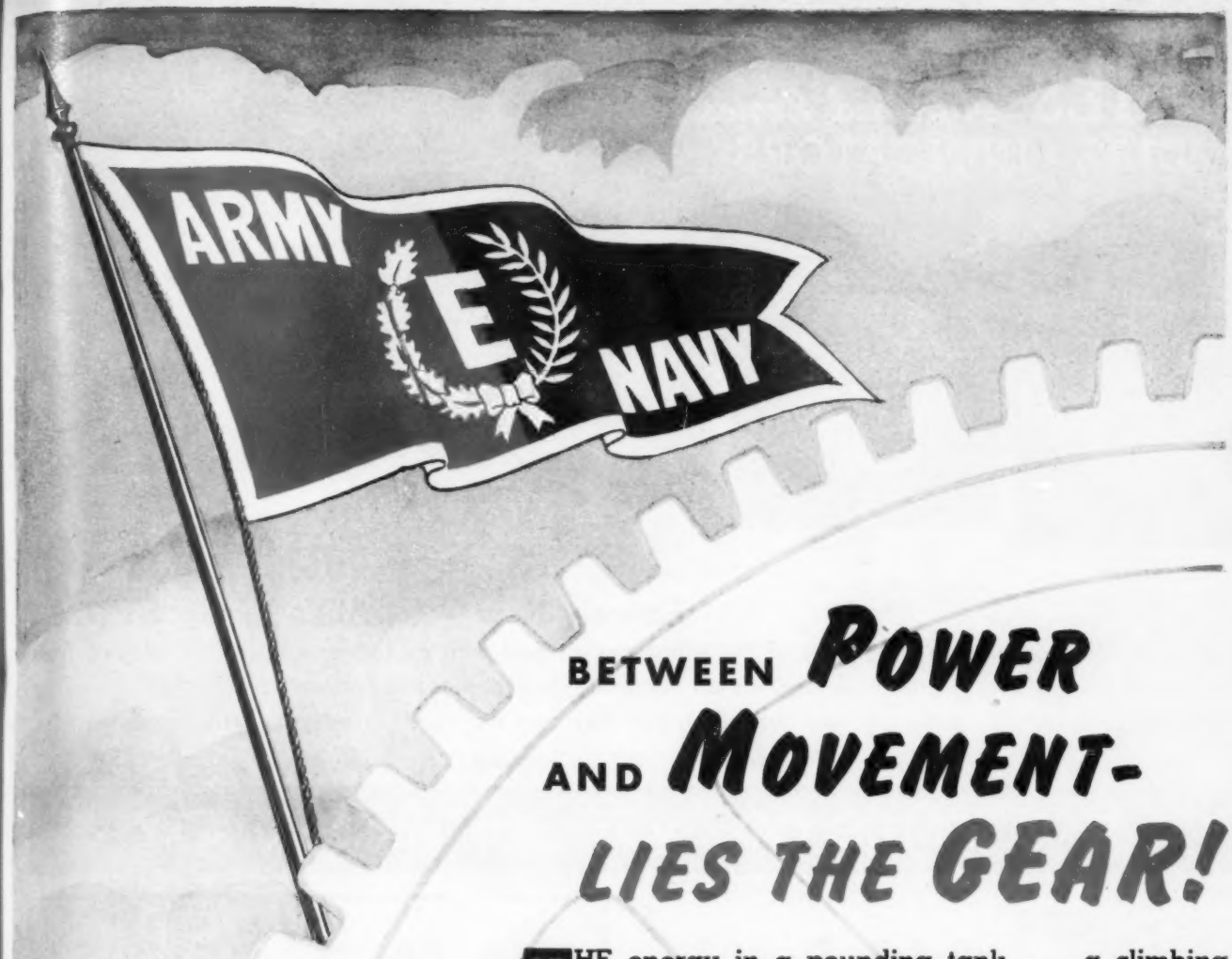
FOR SIXTY YEARS

Spur – SPEED REDUCERS – Worm

ALL TYPES OF CUT GEARS

GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

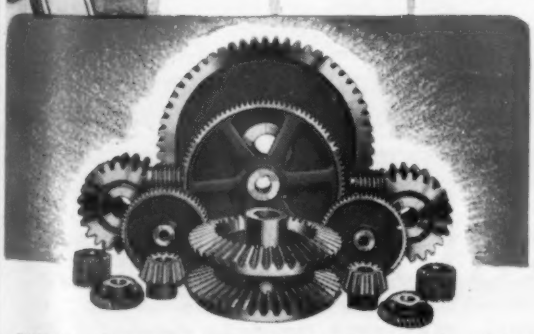


BETWEEN POWER AND MOVEMENT- LIES THE GEAR!

THE energy in a pounding tank . . . a climbing plane . . . a racing PT boat . . . could never have become kinetic energy—energy of movement—without the gear.

Between power and action, the gear is an essential link. No previous war has been so completely a war of machines. And today's armies often cover more space in 24 hours than the armies of the First World War covered in a month.

The need for gears in overwhelming quantities, for gears to conquer new and complex tasks, presented a challenge to the entire gear industry. That we have been awarded the Army-Navy "E" Flag for our part in meeting this challenge is gratifying. We accept it as an honor—and as an obligation to do even better tomorrow than we have today.



THE CINCINNATI GEAR CO.

Wooster Pike and Mariemont Ave., Cincinnati 27, Ohio

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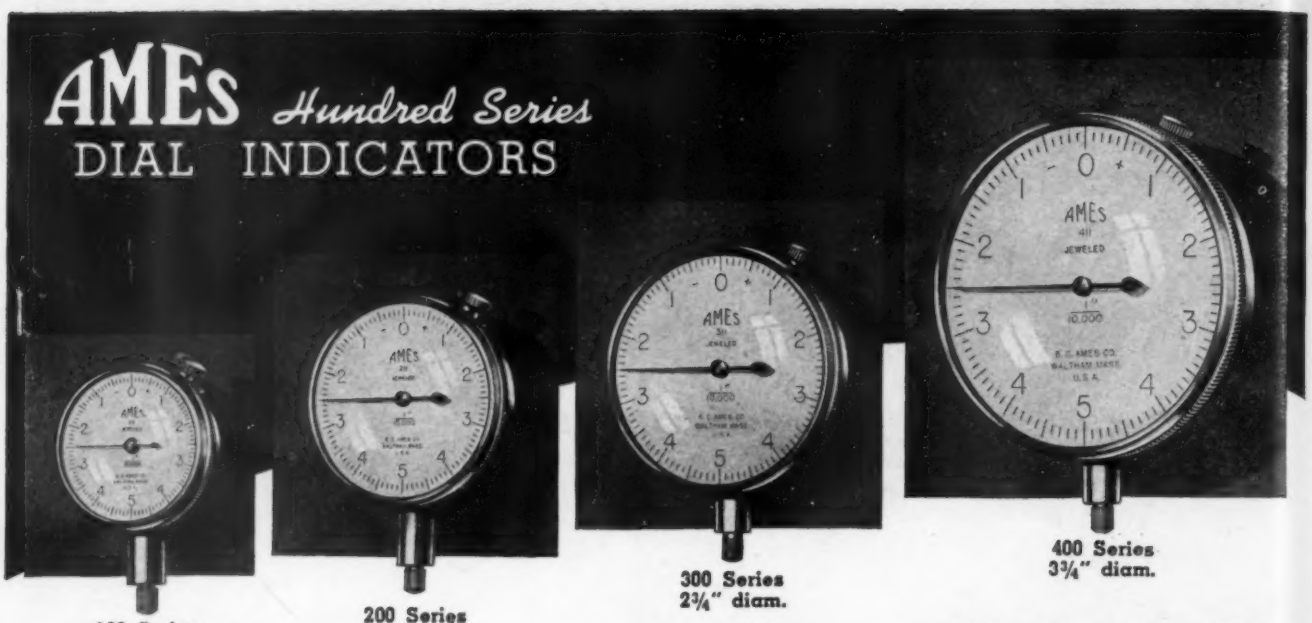
YOUR GREATEST OBLIGATION IS YOUR FINEST INVESTMENT ★ BUY MORE WAR BONDS TODAY

AMEs *Hundred Series* DIAL INDICATORS



100 Series 1-11/16" diam.
200 Series 2¼" diam.
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Entirely New • • • Alike Except in Size

A complete line of modern indicators of the latest design and with exclusive features, developed from experience gained during a half century of manufacturing only the finest instruments of their kind. Superior to all others in quality, accuracy and durability, yet they cost no more. Investigate and compare them.

Catalog No. 52 on request.

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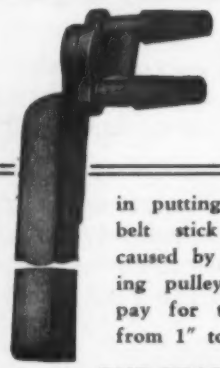

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in putting belts on moving pulleys. The belt stick attachment prevents accidents caused by throwing belts on and off moving pulleys. Avoid accidents rather than pay for them. Two sizes to cover belts from 1" to 4".

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New Features
New Advantages

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Hanna Cylinders

Dependable power for pushing, pulling or lifting. Standard models, air or hydraulic, low or high pressure, for all requirements. Write for full details.

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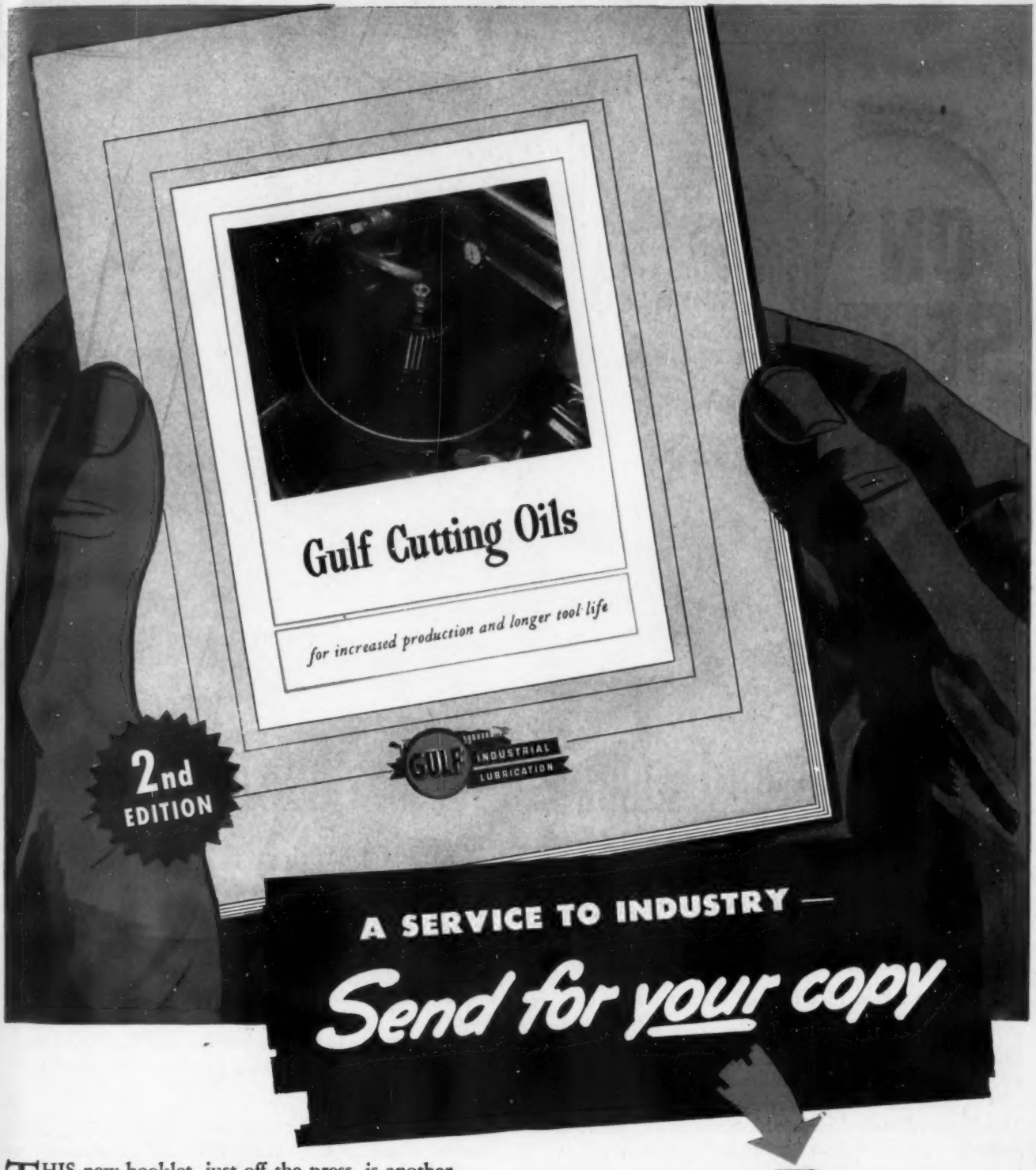
THE HOBART BROTHERS COMPANY, Box AM92, TROY, OHIO *Write for Catalog!*



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It tells of Gulf's new revolutionary cutting oils, scientifically developed to meet today's exacting machining problems.

In addition it contains valuable data on machine shop practice, including cutting speeds, tool settings, tables, etc. To get *your* copy of this useful booklet, just fill in and mail the coupon.

Gulf Industrial Lubrication Service Engineers can help you with your machining problems.

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Please send me a copy of the new revised booklet, "Gulf Cutting Oils," which includes a 40-page Machining Guide.

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Your Bond Selling Responsibilities Double!

Starting September 9th, your Government will conduct the greatest drive for dollars from individuals in the history of the world—the 3rd War Loan.

This money, to finance the invasion phase of the war, must come in large part from individuals on payrolls.

Right here's where YOUR bond selling responsibilities DOUBLE!

For this extra money must be raised *in addition* to keeping the already established Pay Roll Allotment Plan steadily climbing. At the same time, every individual on Pay Roll Allotment must be urged to dig deep into his pocket to buy *extra* bonds, in order to play his full part in the 3rd War Loan.

Your now *doubled duties* call for these two steps:

1. If you are in charge of your Pay Roll Plan, check up on it at once—or see that whoever is in charge, does so. See that it is hitting on all cylinders—*and keep it climbing!* Sharply increased Pay Roll percentages are the best warranty of sufficient post war purchasing power to keep the nation's plants (*and yours*) busy.

2. In the 3rd War Loan, every individual on the Pay Roll Plan will be asked to put an *extra two weeks salary* into War Bonds—over and above his regular allotment. Appoint yourself as one of the salesmen—and see that this sales force has every opportunity to do a real selling job. The sale of these *extra* bonds cuts the inflationary gap and builds added post-war purchasing power.

Financing this war is a tremendous task—but 130,000,000 Americans are going to see it through 100%! This is their own best *individual* opportunity to share in winning the war. The more frequently and more intelligently this sales story is told, the better the average citizen can be made to understand the wisdom of turning every available loose dollar into the finest and safest investment in the world—United States War Bonds.

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BACK THE ATTACK With War Bonds!

This space is a contribution to victory today and sound business tomorrow by YOUR NAME HERE

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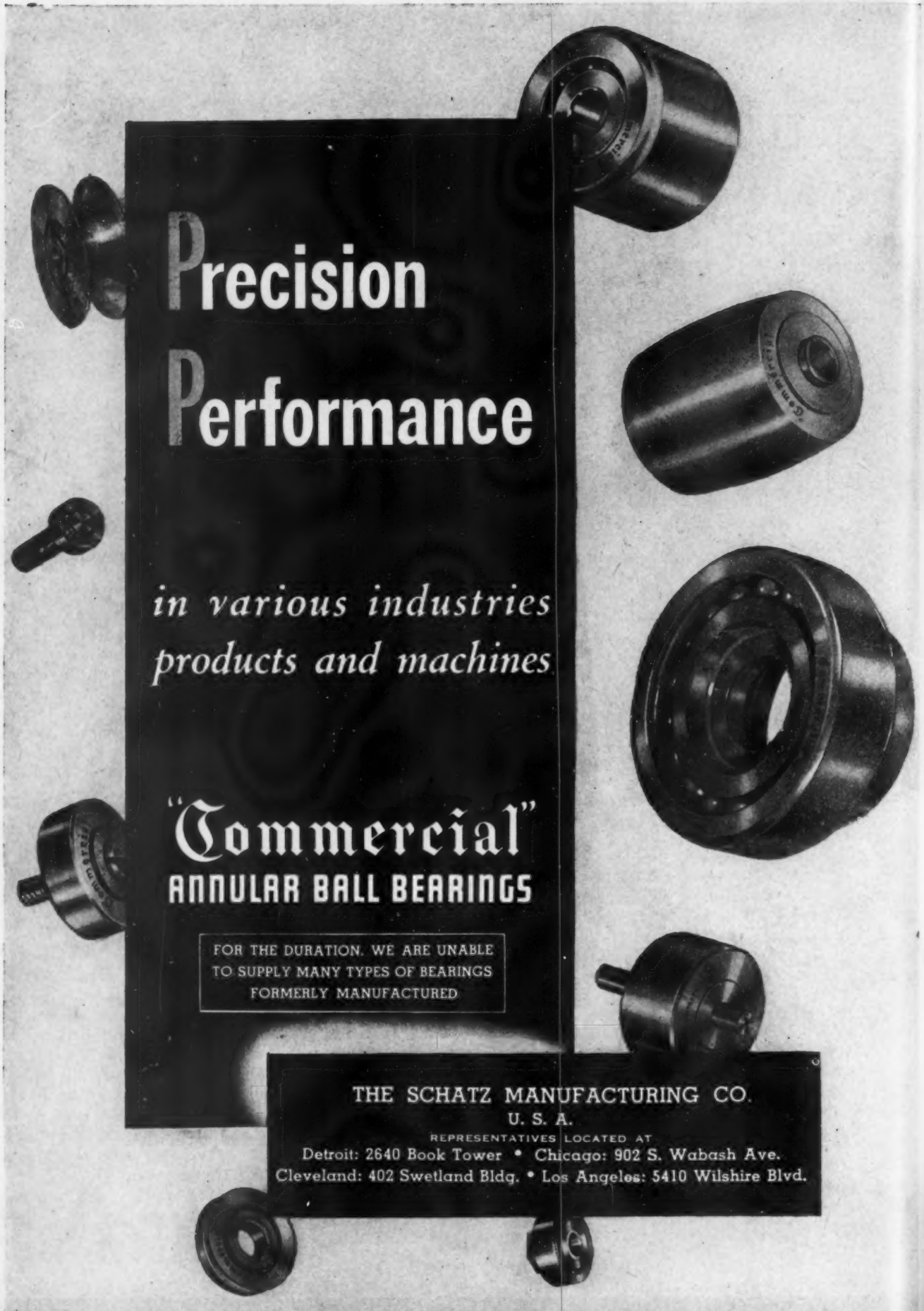
CUTTING MACHINES

help put them in action!

Speedy, tough, maneuverable—the jeep has taken its place as a highly important cog in America's war machine. Helping to deliver jeeps and other war vehicles faster—are DeWalt Cutting Machines. These machines, introducing many new methods of cutting, enable manufacturers to save man power, increase volume and handle fast cutting jobs with an accuracy heretofore unknown.

DeWALT PRODUCTS CORPORATION

Lancaster, Pennsylvania


Precision
Performance
in various industries
products and machines
"Commercial"
ANNULAR BALL BEARINGS
FOR THE DURATION. WE ARE UNABLE
TO SUPPLY MANY TYPES OF BEARINGS
FORMERLY MANUFACTURED
THE SCHATZ MANUFACTURING CO.
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GEARGRIND MACHINES grind internal and external gears, internal and external involute splines, straight splines, racks and serrations, the "HOB-HARDEN-GRIND" way.

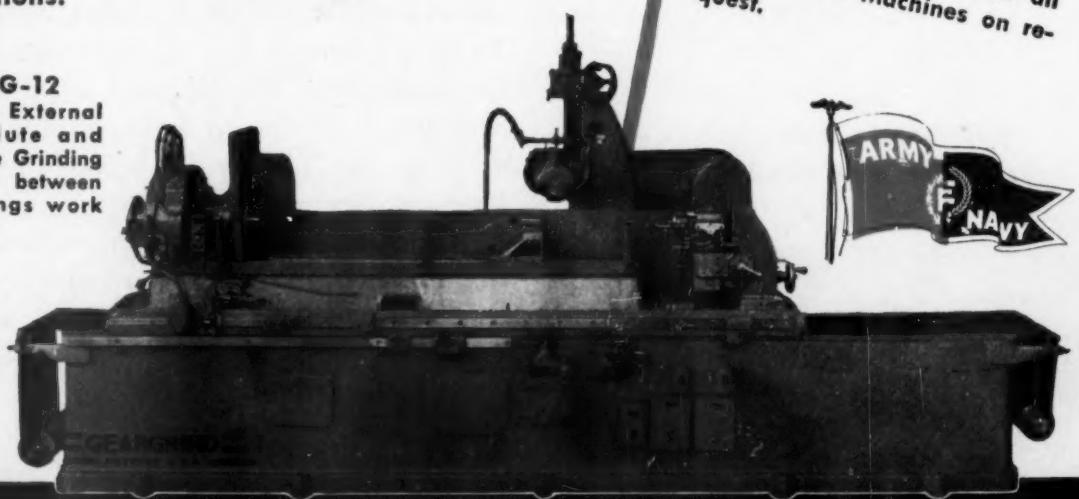
This method assures tooth profiles so accurate that the close precision tolerances of aviation and other war production are met without the customary rejects.

All over the world, GEARGRIND Machines are contributing to the growing might of the United Nations.

FOR ALL TYPES OF STEEL

The Formed Wheel HOB-HARDEN-GRIND process eliminates the worries caused by the frequently changed steel specifications caused by war time emergencies. It is particularly valuable now, when there is no assured supply of special steels, and continued uniformity is problematical. Catalog of all GEARGRIND Machines on request.

TYPE SGG-12
Combination External Gear, Involute and Straight Spline Grinding Machine. 60" between centers. Swings work 12⅞".



The GEAR GRINDING MACHINE COMPANY
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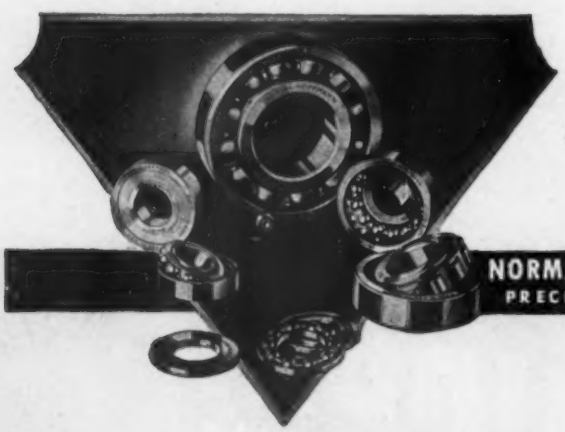
★ HELPING AMERICA PRODUCE MORE! ★

THAT'S WHAT NORMA-HOFFMANN FIELD ENGINEERS ARE DOING, TODAY

★ They're out on America's "production fronts," giving freely of their highly specialized experience, assisting manufacturers of armament, equipment, munitions and supplies in keeping production lines moving. They're aiding MACHINE BUILDERS to apply anti-friction bearings more economically and efficiently. They're helping MACHINE USERS to get the most from the bearings they have—to lengthen their life—to reduce shut-down hazards. At our factory, The Engineering and Research Departments are equally busy, solving problems in bearing application, operation and maintenance submitted by buyers of bearings in every field. And all this service is being rendered without cost, THAT AMERICA MAY PRODUCE MORE.

Write for the Catalog.
Let our engineers work with YOU.



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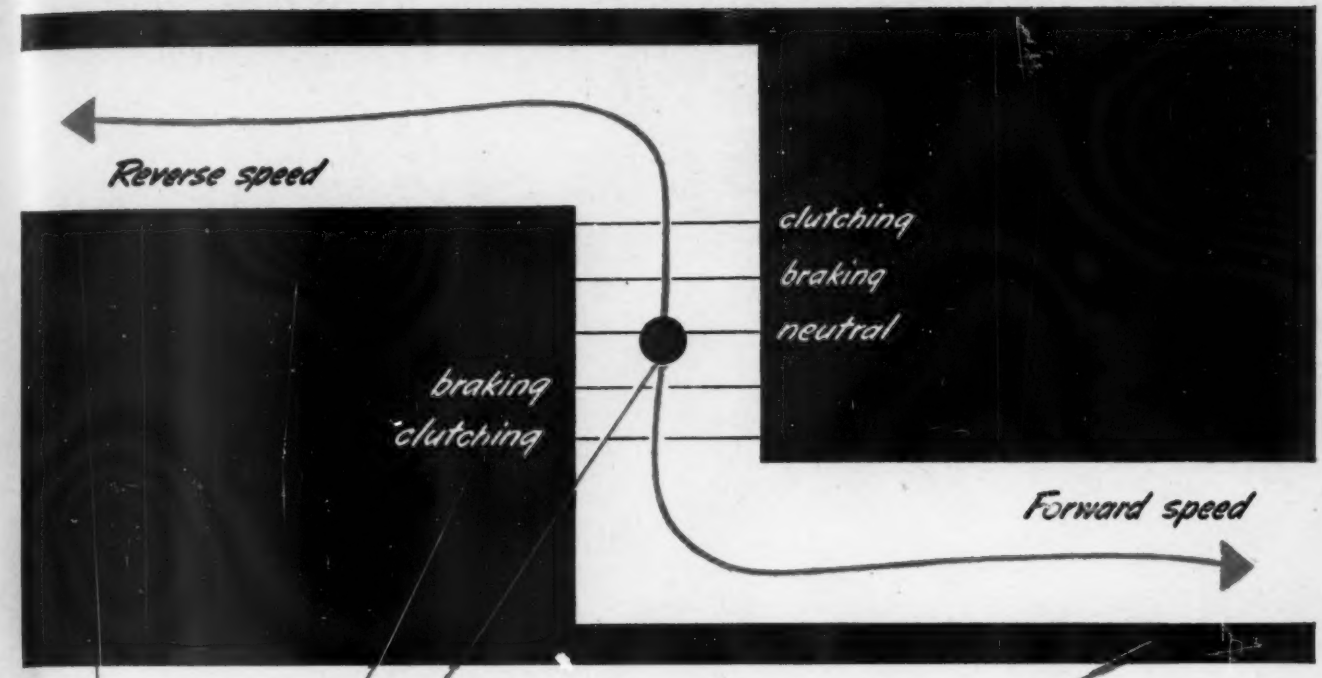

Check your control problems

along these lines

In almost every plant . . . and in many mechanical products . . . there's a place where a simple, dependable, and economical remote control system would help to boost production, or add salability. These are the places that W·A·B Remote Control Systems are designed to fill.

These controls place complete command of any series or sequence of operations directly under the thumb of the operator. Just as an example, consider this graphic indication of an engine control cycle used on shipboard.

All engine operations involved in maneuvering the ship—speed control, braking, clutching or reversing—are governed by a simple movement of the control handle.

It is impossible for the operator to alter the order of these operations and so damage the equipment . . . yet the timing is completely under his control.

One of our representatives will be glad to discuss your control problems with you, and recommend a solution. In many instances, no special equipment is required; standard, immediately available, "off the shelf" W·A·B devices can do the job. Write, wire or phone.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

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74 Years of Pneumatic Control Experience

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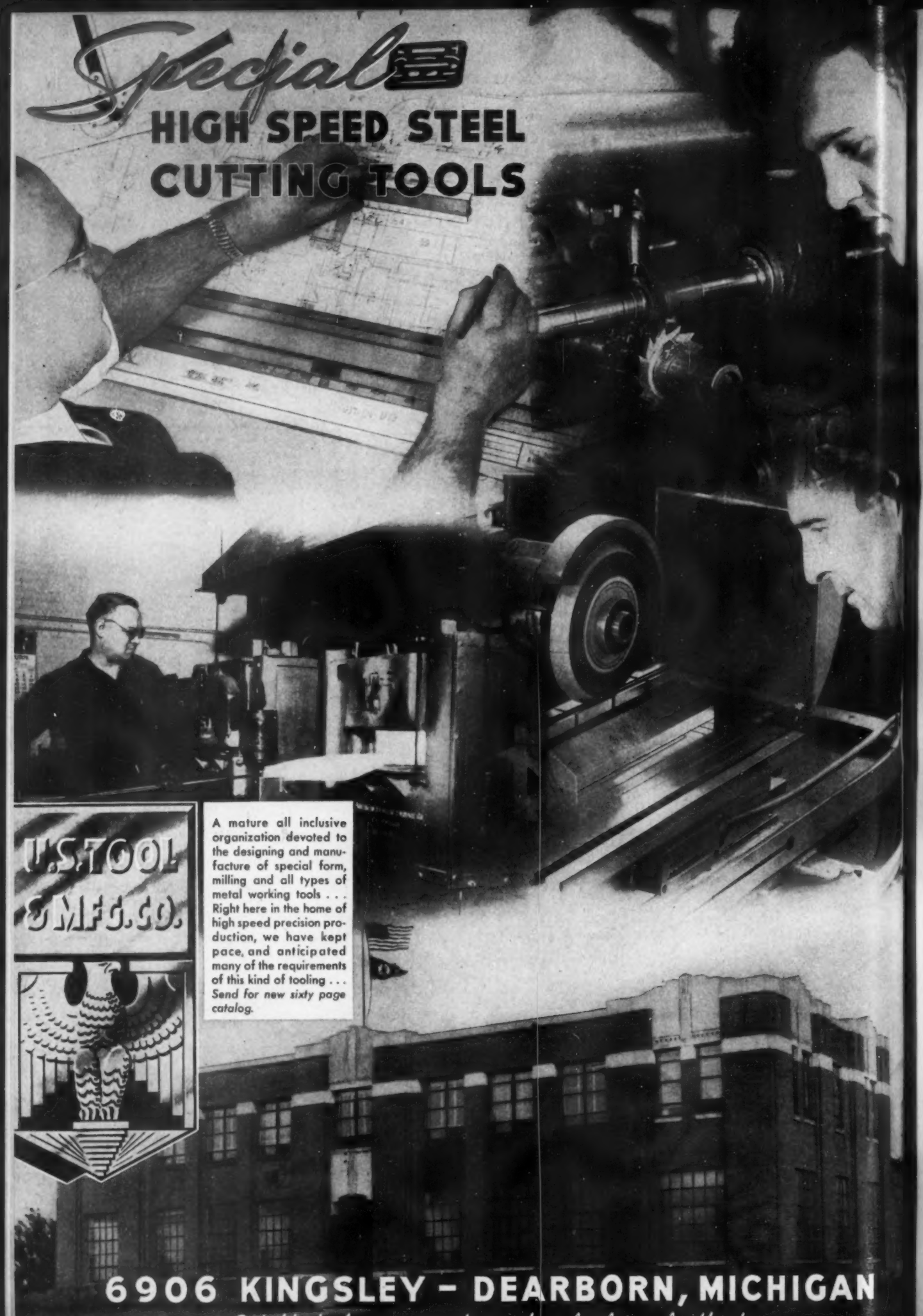
remote control systems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HIGH SPEED STEEL
CUTTING TOOLS
U.S. TOOL
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A mature all inclusive organization devoted to the designing and manufacture of special form, milling and all types of metal working tools . . . Right here in the home of high speed precision production, we have kept pace, and anticipated many of the requirements of this kind of tooling . . . Send for new sixty page catalog.
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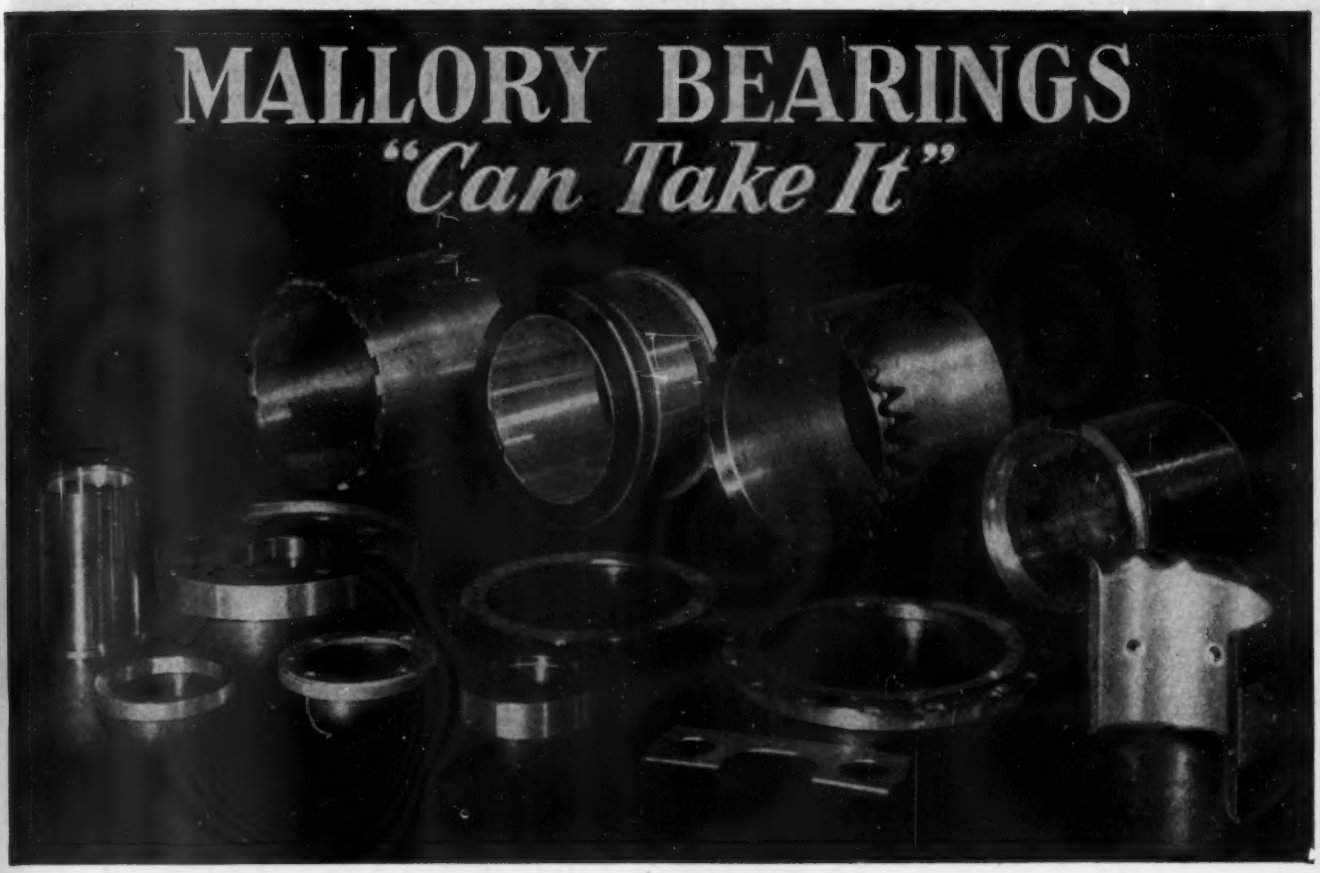
Established in nineteen hundred and thirty

MALLORY BEARINGS
"Can Take It"



RELIABILITY under brutal punishment is the first essential for aircraft engine bearings. Increasingly, they are called on to withstand greater stresses and fatigues. But Mallory Bearings can—and do—"take it", as the daily performance of thousands of fighter planes and bombers will attest.

To hold up under the terrific pressures imposed by combat conditions, Mallory Bearings must be finished to an accuracy that even a few months ago was considered a laboratory dream. Today, thanks to brilliant engineering progress in machine design, bonding and testing technique, Mallory Bearings and other parts silver-surfaced by the Mallosil Process are rolling off production lines, made with precision accuracy that meets the most exacting requirements.

Mallory Bearings are made by the Mallosil Process . . . the Mallory method of bonding rare metals (such as silver) to base metal backings. The process is applied effectively to both ferrous and non-ferrous metals . . . even when heat treated . . . without affecting their physical properties.

The Mallosil Process makes possible precision production, not only of bearings, bushings, pinion races, gear supports and other aircraft engine parts, but other applications in aircraft manufacture. Collector rings with Mallosil surfacing provide long, efficient service in the control mechanisms of bomber power turrets. Mallosil-processed copper coils, rivets, fuse clips, circuit breakers and relay parts give longer and better performance in electrical and communications devices.

Today, Mallory Bearings and other products improved by the Mallosil Process are given over to War effort. Tomorrow, those products will be available for peace-time development. And Mallory engineers will have a wealth of technique and experience to place at the disposal of every manufacturer who is planning design improvements for high-speed motive units. Consult us.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA
Cable Address — PELMALLO

Trademarks Reg. U. S. Pat. Off.—Mallosil, Rectostarter, Vibrapack

P R MALLORY & CO Inc
MALLORY

SERVES THE AVIATION, THE AVIATION-INSTRUMENT AND THE AVIATION-COMMUNICATION FIELD WITH WELDING TIPS, THE MALLOSIL PROCESS—BEARINGS, SPECIAL ALLOYS, ELECTRICAL CONTACTS, VIBRATORS, VIBRAPACKS, CONDENSERS, ROTARY AND PUSH BUTTON SWITCHES, ELECTRONIC EQUIPMENT, COMMUNICATIONS HARDWARE, RECTOSTARTERS

QUALITY BUILT BEARINGS

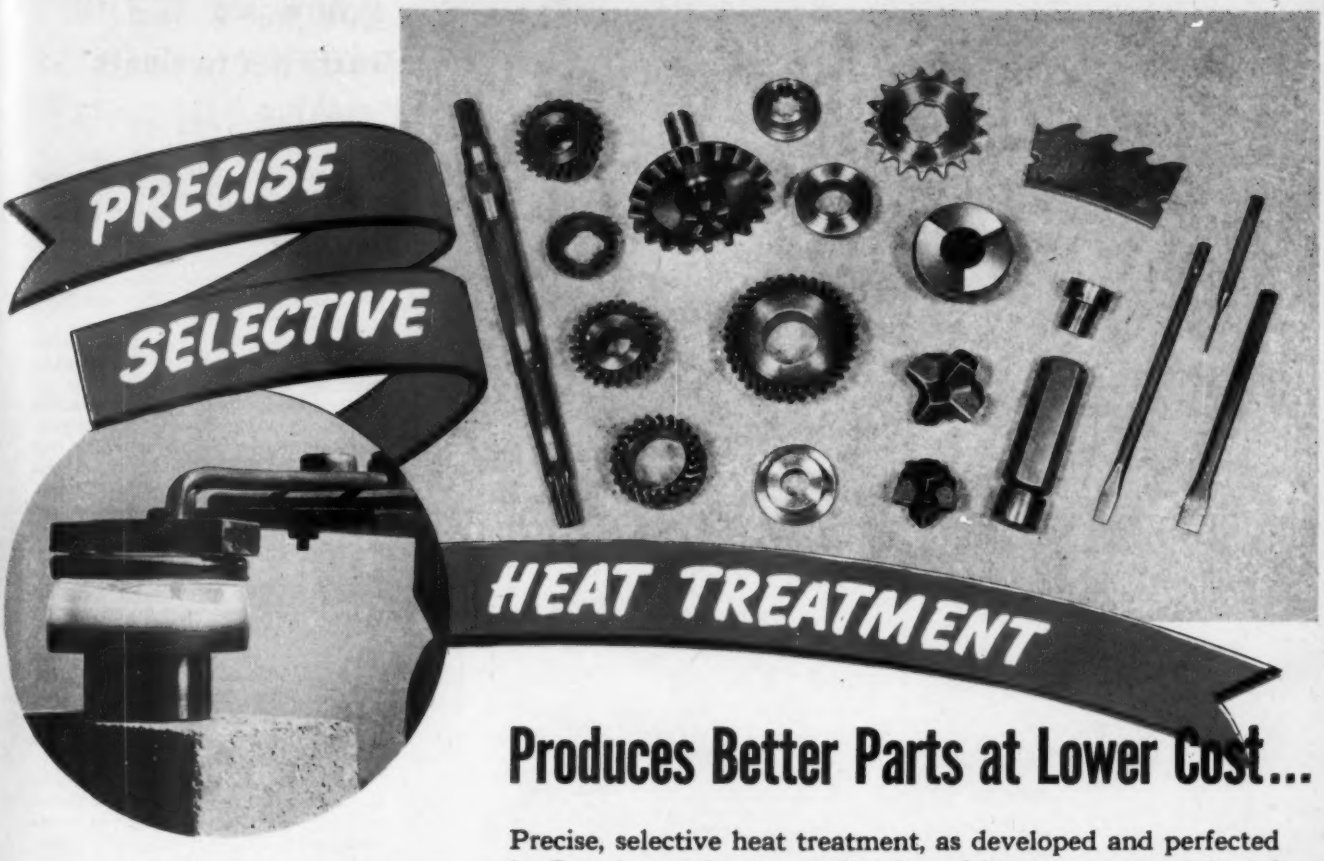
● A basic principle, scientifically correct, and sound engineering design are complemented in the Link-Belt bearing plant, by precision manufacture. These views, taken at various stages in the manufacture, assembly and inspection of Link-Belt Friction Fighter bearings, merely suggest the completeness of facilities and the meticulous attention to quality, controlling every phase of their production—good reasons why Link-Belt Friction Fighter bearings are giving outstanding service throughout industry. Link-Belt Company, Indianapolis 6, Chicago 9, Atlanta, Philadelphia 40, Dallas 1, San Francisco 24, Toronto 8. 8234

LINK-BELT

FRICTION FIGHTER

BEARINGS

Roller and Ball Types



Heat treating the wearing face of a coupling by the Lepel High Frequency Induction Heating Process. Toughness and ductility of the balance of the part is unimpaired.

The heart of precise, selective heat treating, the Lepel High Frequency Induction Unit—compact, easily movable, relatively inexpensive. Operated manually or fully automatic.

Produces Better Parts at Lower Cost...

Precise, selective heat treatment, as developed and perfected by Lepel, permits the application of heat up to any selected temperature, *exactly* where it is required and for the *exact* period of time necessary to produce the desired result.

Amazing in its speed, Lepel equipment reduces from minutes to seconds the time required for hardening, annealing, stress relieving and for brazing and soldering—the same unit performing all of these operations. Yet it maintains a degree of precision and uniformity rarely attainable through other methods.

Fully automatic operation is possible, eliminating the human equation and assuring speed, economy, conservation of manpower and critical materials and a minimum of rejections.

Lepel equipment achieves the ultimate in simplicity of operation, dependability and cleanliness. As a result, Lepel installations in many leading war industries are operated entirely by women.

While Lepel equipment has been a boon to wartime production, it is instantly adaptable to peace-time applications without any conversion whatever.

Write or wire for complete information, or, better still, send us samples of your work with specifications for heat treating, brazing or soldering. Our engineers will then perform the work specified and return the samples with specific data, recommendations and cost estimates. This service entails no expense or obligation on your part.

Lepel

LEPEL HIGH FREQUENCY LABORATORIES, Inc.

PIONEERS IN INDUCTION HEATING

39 West 60th Street • New York, N. Y.

HIGH FREQUENCY INDUCTION UNITS

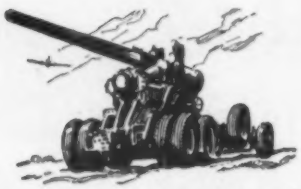
Parts for industry

UPSET FORGINGS • DROP FORGINGS • MEEHANITE CASTINGS • NON-FERROUS CASTINGS • STEEL ALLOY CASTINGS • CENTRIFUGAL CASTINGS • IRON CASTINGS • BEARINGS • MOLDED PLASTIC PARTS • AIR COMPRESSORS

for Excavating

Placer dredge buckets. Power shovel dippers. Dredge pumps. Non-ferrous bearings and castings.

for Guns

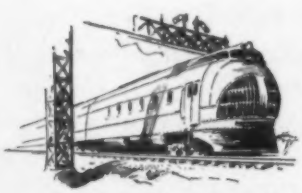


Upset forgings, non-ferrous castings for naval and field guns. Liners. gear blanks, parts for gun assemblies.

for Planes

Tail wheel assemblies and retractable landing gears. Actuating cylinders. Brake lining. Non-ferrous castings. Forgings.

for Trains

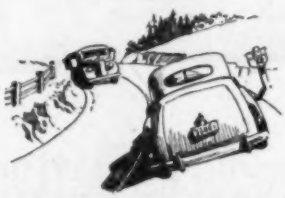


Brake shoes. Journal bearings. Meehanite castings. Freight car wheels. Manganese steel center and wear plates.

for Ships

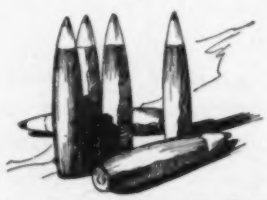
Strut and stern tube bearings. A-B-K deck plates and safety treads. Air compressors. Non-ferrous castings and bearings.

for Cars — Trucks



Brake lining, clutch facings, fan belts, radiator hose. Axles, shafts, gear blanks and engine forgings. Service equipment.

for Battle



Steel armor plate. Bomb part castings. Shell and shot forgings. Torpedo parts. Parts for guns.

58 PLANTS SERVING INDUSTRY AND TRANSPORTATION

American Brakeblok Division
Detroit, Mich.

Ramapo Ajax Division
New York City

American Manganese Steel Division
Chicago Heights, Ill.

Brake Shoe & Castings Division
New York City

Kellogg Division
Rochester, N. Y.

American Forge Division
Chicago, Ill.

Southern Wheel Division
New York City

National Bearing Metals Corp.
St. Louis, Mo.

To us each part is as important as the whole

AMERICAN Brake Shoe COMPANY

AMERICAN BRAKE SHOE COMPANY
230 PARK AVENUE, NEW YORK 17, N.Y.

How would YOU advertise a business making only parts?

We'd like your help. Suppose your company were made up of eight Divisions, with 58 plants making hundreds of kinds of parts for industry and transportation. And suppose you had growing pains, and decided to advertise for new customers. How would you tell your story?

The wide range of parts we make —or could make—is what complicates the problem.

For instance, one of our Divisions makes all kinds of iron castings—white iron, grey iron, Meehanite, and NiHard. It is the country's largest maker of brake shoes for railroads.

Another Division makes just about every type of upset and drop forging. Its plants have tremendous capacity, and its organization has, we believe, the broadest forging experience in the industry.

A third Division makes brake linings for automobiles, trucks, buses, airplanes and industrial equipment. Its "American Brakeblok" brand is a leader in this field. This Division also makes molded plastic bearings and industrial shapes.

Still another Division is a leader in the field of railroad track fixtures, and could make more products in manganese and other tough steels.

A fifth Division makes air compressors, paint spray guns, and equipment for motor service stations, and is producing machined parts for aircraft and airplane engines.

Another Division produces a wide variety of parts for heavy-duty industrial equipment, such as power shovel dippers, dredge pumps, placer dredge buckets, material handling pumps. Also logging, pulp mill and mining equipment parts. This same division manufactures special welding rod for hard surfacing and has a department devoted to heat and corrosion resistant alloys.

A seventh Division manufactures freight car wheels for railroads.

Non-ferrous bearings and industrial castings, babbitt metals and non-ferrous welding rod, are produced by still another Division.

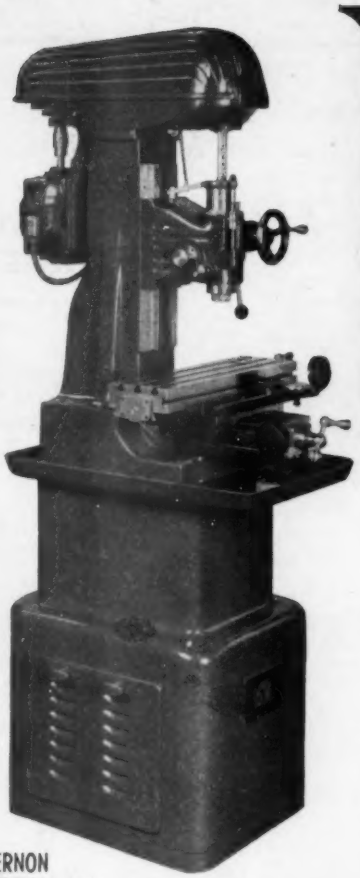
These eight Divisions, forming American Brake Shoe Company, are capable of supplying parts and product-parts of highest quality, and in practically unlimited volume, to industry and transportation. They are served by outstanding research and engineering laboratories.

Just now we are devoting our energies wholeheartedly to producing parts and assemblies for war. We are open to additional contracts for some types of parts. When the war ends, our eight Divisions will offer a production capacity, and a know-how, that will give Brake Shoe a decided edge as a source for parts.

The problem of telling this story, understandably and with proper modesty, is a tough one. We've tried to picture it in the adjoining advertisement. But have we succeeded? If you, as a director of purchases, or a technical man, can give us any helpful suggestions, we'll tremendously appreciate hearing from you.

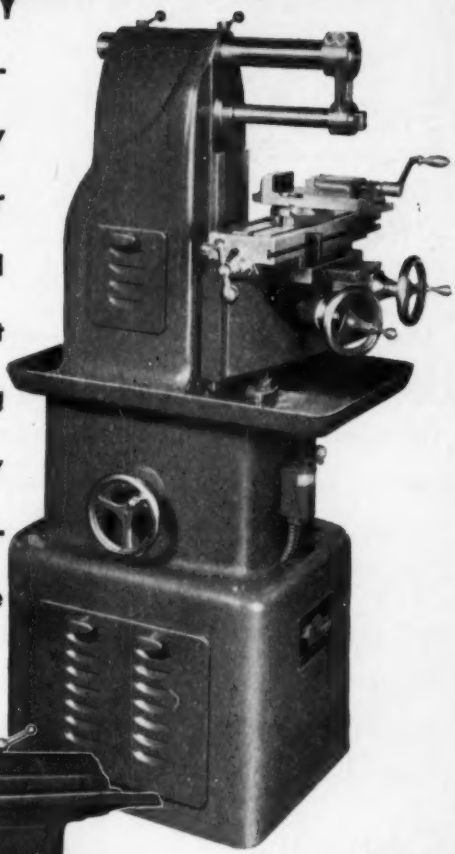
AMERICA'S FAVORITE PRODUCTION WEAPONS

Vernon MACHINE TOOLS



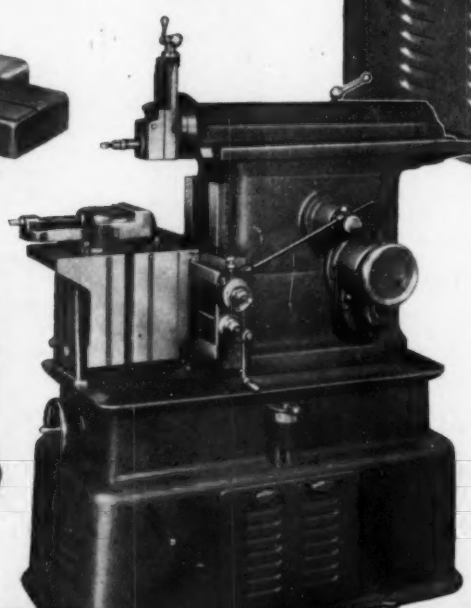
VERNON VERTICAL MILL AND JIG BORER

Low in cost—high in production • Split-hair accuracy with an abundance of power • Economical and long lived operation • All important engineering and operating features • Many standard accessories for each machine



VERNON PRECISION NO. 0 MILL

VERNON UNIVERSAL TOOL AND CUTTER GRINDER

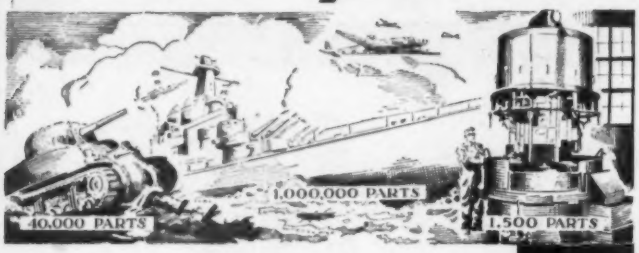


VERNON PRECISION BACK-GEARED 12" SHAPER

MACHINERY MANUFACTURING COMPANY
1915 EAST 51st STREET • LOS ANGELES 11, CALIFORNIA

Vernon Line of **HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS**

The part of ALLENS *is to* HOLD *parts*



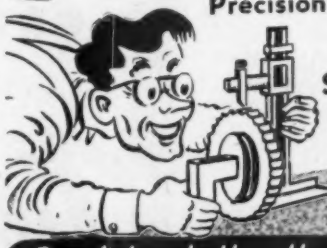
Until the one-piece machine is built we'll be dealing with *parts.* And the parts of production- and war-machines are made of the strongest suitable materials. These seldom fail in the unit; they commonly fail in the assembly. Something — just one fastening — lets go, and the machine *in toto* quits. Try to figure the cost in a hard-pressed tool-room, or a still more hard-pressed battle line!

ALLEN Hollow Screws might initially cost more than certain other types of screws or fastenings. But by standing more they stand *you* less,—less the cost of failures. There's only one standard of value in fastenings: — the most DEPENDABLE are the *least expensive.*

Order through your local Allen Distributor, to take advantage of his *mass-purchasing agency* for your locality.

THE ALLEN MFG. COMPANY
HARTFORD, CONNECTICUT, U. S. A.

GAUGE MAKERS all over the country are standardizing on Smiths when **Precision Accuracy** is required



All Smith **SURFACE PLATES** are **MASTERS**

Send for fully illustrated literature

Smith Master Surface Plates
Smith Precision Lapping Plate
Elliptical Rib Construction Exclusive with Smith
Smith Master Surface Plate and Stand

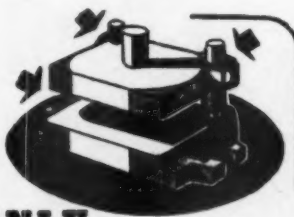
Available Sizes

8 x 12	18 x 24	30 x 36
9 x 14	24 x 24	30 x 60
12 x 18	20 x 30	36 x 68
18 x 18	24 x 36	★

★ Other sizes to order

For prices and delivery, write, wire or phone

SMITH TOOL & ENGINEERING CO.
851 N. Sandusky Ave. Bucyrus, Ohio



DANLY
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DANLY MACHINE SPECIALTIES, INC.
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THEIR PRECISION
Means Greater Accuracy In Your Production
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Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to **HELL**

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
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"All right, What's Next?"

Across the drafting boards and through the Contract Division of the Taft-Peirce Manufacturing Company moves an endless train of special machines and products, as well as the tools with which to make them . . . design, development, and production for other plants in every line of industry, *including yours.* Seldom are any two of these problems similar in concept, function, or materials, yet they all encounter here a common denominator of experience which translates them into practical workable form, whether it involves a single part, or production lots of complete mechanisms or machines.

This exceptional breadth of experience in pre-war industry has given Taft-Peirce an equally broad opportunity for service in the war effort, without restriction to any one type of work. Taft-Peirce offers ever new and specialized knowledge and skill to manufacturers who need to supplement their own capacity or who require the aid of actual experience in the use of tomorrow's materials and methods which they, themselves, have not yet had the opportunity to use. If you have a problem in design, development, tooling, contract manufacturing, you are invited to:

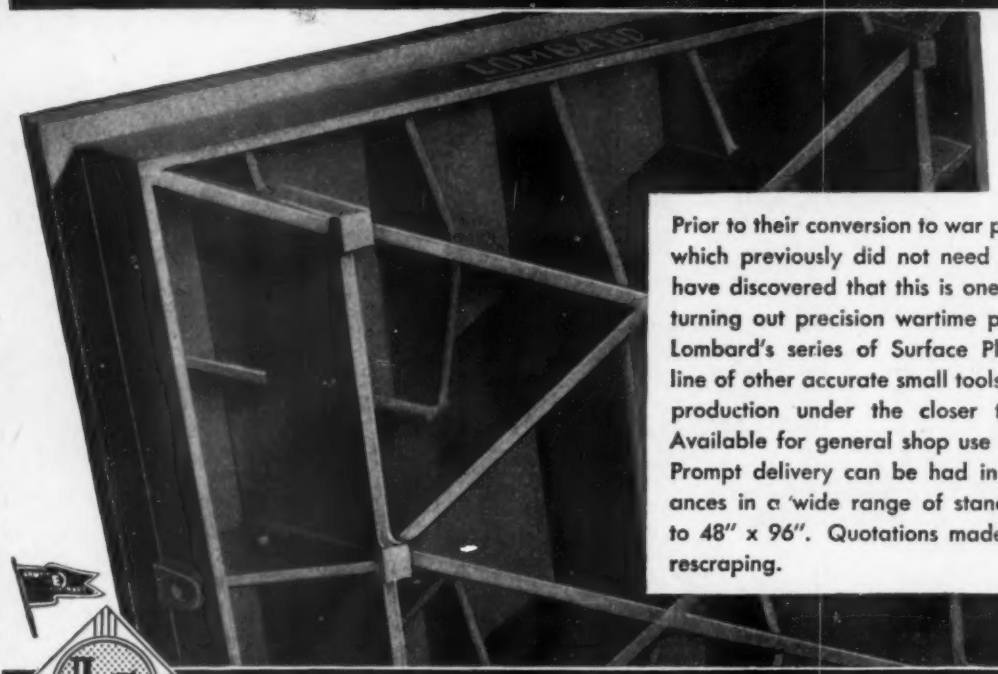
Take it to TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO., WOONSOCKET, R. I.

Manufacturers of Machine Tools . . . Small Tools . . . Gages . . . Reamers . . . Aircraft Service Equipment . . . Magnetic Chucks, etc.

DESIGNERS AND CONTRACT MANUFACTURERS OF TOOLS AND SPECIAL MACHINES

INSPECTION *is Vital!*



Prior to their conversion to war production work many shops which previously did not need close inspection equipment have discovered that this is one of the prime requisites for turning out precision wartime parts.

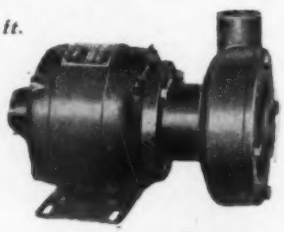
Lombard's series of Surface Plates, as well as complete line of other accurate small tools has made possible greater production under the closer tolerances now necessary. Available for general shop use as well as inspection work. Prompt delivery can be had in various grades and tolerances in a wide range of standard sizes from 14" x 18" to 48" x 96". Quotations made also on special sizes and rescraping.

Surface Plate shown is Lombard Commercial Style.

LOMBARD GOVERNOR CORPORATION

500 MAIN ST., ASHLAND, MASS., U. S. A.

Horizontal type. 5 to 60 gpm. Heads to 25 ft.

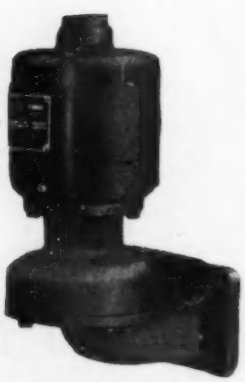


10,000 TIMES

its own weight in coolant per day

Sidewall type without seal. 5 to 50 gpm. Heads to 19 ft.

Immersion type. 5 to 150 gpm. Heads to 125 ft.



Sidewall type with seal. 5 to 60 gpm. Heads to 25 ft.

A coolant pump is a small accessory on a machine tool, but it has a most important job to do. In a day's time this tiny pump handles about 10,000 times its own weight in coolant liquid. It must stay on the job—without it no machining can be done.

Ingersoll-Rand coolant pumps have this vital quality of staying on the job. They are simple, efficient and dependable. There is a complete range of sizes in immersion, sidewall and horizontal types. Ingersoll-Rand Company, Cameron Pump Division, 11 Broadway, New York, N. Y.

Ingersoll-Rand

9-302

See an Ozalid machine in operation

The chances are—Ozalid whiteprints are being made in a plant in your vicinity ...and you may be able to witness a demonstration of simplified printmaking.

Bring your own engineering drawings. *See* how you can make whiteprints in one continuous operation . . . and save time, labor, and materials.

COMPARE OZALID WITH ANY OTHER METHOD

You'll be surprised at the compactness of an Ozalid machine.

It can be installed in any corner of the drafting room. This saving in floor space is possible because Ozalid eliminates the chemical baths, driers, and plumbing connections employed in other processes.

This simplification allows you to quickly train an inexperienced person to operate the machine at top efficiency.

In addition, you get exclusive printmaking extras! . . .

CHECK THESE OZALID EXTRAS

1. You're able to use the widest variety of sensitized materials—papers, cloths, and foils . . . and make prints having blue, black, or maroon lines on a white background.

You'll find that Ozalid whiteprints are easier to read and check than blueprints. They are also fade-proof and wash-fast.

2. You make "duplicate originals" in the same manner as standard prints —no Van Dyke difficulties. These may be used in place of the original in subsequent print production...or to eliminate unnecessary drafting when making design changes.

It is not necessary to redraw any part which remains the same as in the original!

3. You're able to use cut sheets as well as roll stock in an Ozalid machine, thereby eliminating trimming waste.

No paper is lost by pasting up "leaders."

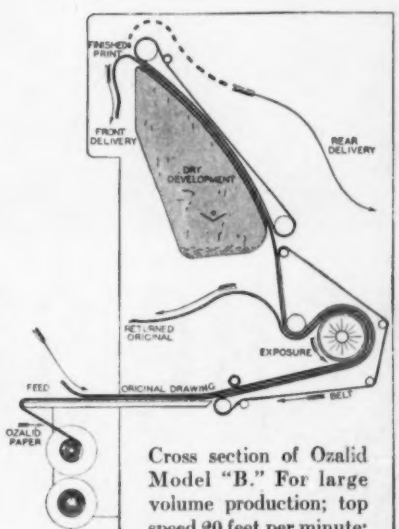
No prints are unusable because of distortion.

FULL LINE OF MACHINES

There's an Ozalid machine for every print production requirement. So if you want to turn out prints at speeds up to 20 feet per minute—or if you need only a dry developing unit to use with your present printer—adopt Ozalid.

Write for catalog and sample booklet of whiteprints. See how leading manufacturers, save time, labor, and materials.

OZALID—MORE THAN A PRINTMAKING PROCESS



Cross section of Ozalid Model "B." For large volume production; top speed 20 feet per minute; front or rear print delivery; many new features.

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

Johnson City, N. Y.

OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

YOU CAN DEPEND ON ONE SOURCE FOR ALL THESE TOOLS

MILLING CUTTERS • BROACHES • COUNTER BORERS • REAMERS • GEAR CUTTERS • UNGROUND GEAR AND SPLINE HOBS • GROUND AND UNGROUND MULTIPLE THREAD MILLING CUTTERS • GROUND FLAT, DOVETAIL AND CIRCULAR FORM TOOLS AND SPECIAL CARBIDE TOOLS

In making weapons for the battles of today, and in building the machines of peace tomorrow . . . good tools are and always will be vital. Whether your particular production calls for simple or intricate tools, you can depend on one source for the design and manufacture of cutting tools that completely fulfill your most exacting specifications.

LAKE SHORE

TOOL WORKS

Division of

CARBIDE TOOL COMPANY

816 NORTH KOSTNER AVENUE, CHICAGO, ILLINOIS

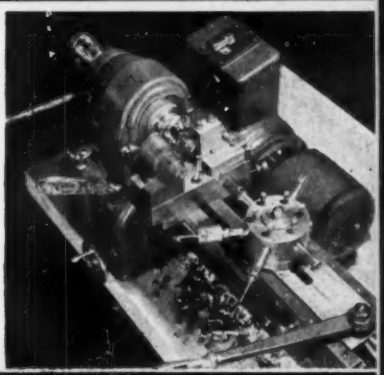
● **Write for quotations on your high speed and carbide production tool requirements.**

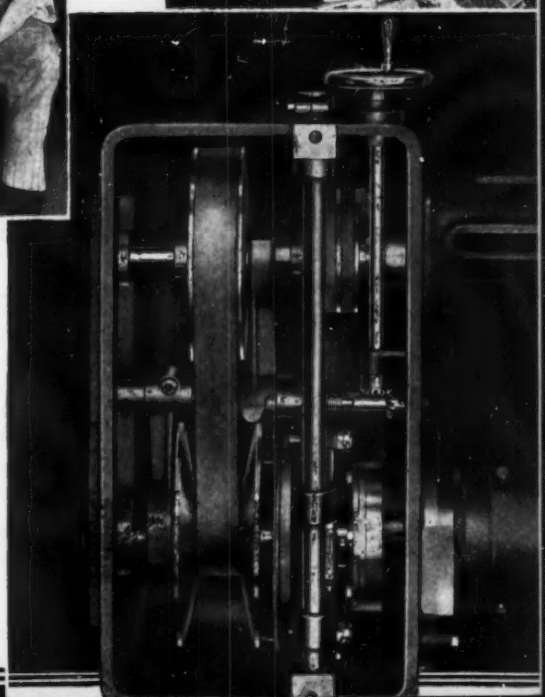
"Stark"

Integral Drive

PRECISION BENCH LATHE

new stream-liner incorporating ll the old Stark accuracy and stamina





THE first tool of its class with built-in Motor and speed changing mechanism (patented). Marvelously compact; nothing under the ch; no special bench or cabinet needed; even ting down unnecessary:

ply moving control lever to right engages the tch, vertical position releases; moving to the instantly brakes the moving spindle.

ndard (tool room) Model has time-tried double er spindle bearings 156 to 2200 r.p.m.—the best sustained accuracy.

gh speed (manufacturing) Model fitted with t precision pre-loaded anti-friction bearings, to 3500 r.p.m.

th have 40 inch bed, 9 inch swing, 20 inches between centers; either ¾ or nch collet capacity. Take regular STARK Attachments collets and chucks. is Stark (patented) built-in drive, integral with the Lathe itself, employs ½ h.p. geared ball-bearing motor drive through a disc clutch, and through belts to the headstock, giving any split speed at the turn of the small hand eel in front of operator.

Write for full information

STARK TOOL COMPANY

WALTHAM, MASS., U. S. A.

ESTABLISHED 1862

★★★★★★★★★★★★★★★★★★★★★

Air Express Rates Reduced

Effective July 15th, Air Express rates within the United States were substantially reduced—many reductions ranging as high as 12½%, depending on the weight of the shipment and the distance it moves. As a result, the average saving to shippers amounts to 10½%.

Increased volume of Air Express traffic stimulated by wartime demands on this fastest form of shipping service—accompanied by peak efficiency in handling—has made it possible to pass these savings along to shippers of air cargo.

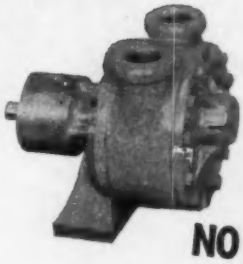
So now, more than ever, *it pays to ship by* AIR EXPRESS!

NOTE TO SHIPPERS

To keep costs down—*pack compactly*, obtaining best ratio of size to weight. To insure fastest delivery—*ship when ready*—as early in the day as possible. *Ask* for our new 1943-44 CALENDAR-BLOTTER. Write Dept. PR-10, Railway Express Agency, 230 Park Avenue, New York 17, New York.

AIR EXPRESS
Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States



HIGH-PRESSURE PERFORMANCE THAT REQUIRES NO HIGH-PRESSURE SELLING

TUTHILL MODEL CK PUMPS GIVE YOU THESE ADVANTAGES

Actions speak louder than words with Tuthill Model CK high-pressure pumps. Designed for service on machine tools, engines and hydraulic mechanisms, these positive-displacement, internal-gear rotary pumps save space, time, material and money, due to their compact design and efficient operation. Furnished with direct motor drives, V-belt units and integral drives in capacities from 1 to 50 g.p.m. and pressures up to 400 p.s.i.

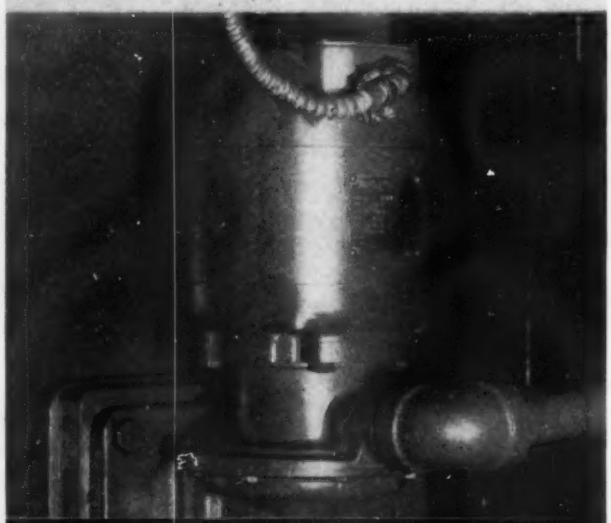
Write for Tuthill Catalog on pumps for production machinery and scores of war-time applications.

TUTHILL PUMP COMPANY
939 EAST 95TH STREET • CHICAGO, ILLINOIS

There's No Intake Piping needed with No. 240

Brown & Sharpe Motor Driven Centrifugal Pumps No. 240 have intakes incorporated in flange mountings. Installations are neat and simple. Send for complete pump catalog. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

B·S



BROWN & SHARPE PUMPS

Less Absenteeism

IN MOTOR OPERATION

WHEN THE Monitor
THERMALOAD V
SOLENOID STARTER
GUARDS AGAINST EXCESSIVE OVERLOAD

The Monitor Thermaload V Solenoid Starter is designed to play an important part in "Production for Victory". For this proved-superior starter gives positive protection against breakdowns and premature motor wear due to excessive overload. No matter where your motors operate . . . in numbing cold or tropic heat . . . you can be sure that the Thermaload V will function efficiently, add life to your motors, reduce your maintenance costs and provide an effective safeguard against work schedule interruption. Specify Monitor Thermaload V Solenoid Starters for original equipment and for replacement. They are available NOW — from stock — subject, of course, to existing priority regulations. See your Monitor field engineer or write for shipping data, technical and installation details.

★ *Available for 1.5 to 7.5 H. P. — 110 to 550 Volts (A.C.) Also in combination units.*

PERFORMANCE-MINDED DESIGN

1 EXCLUSIVE MONITOR COMPENSATED OVERLOAD RELAY

Ambient temperatures will not affect its performance . . . the trip always occurs within the same time at a given percentage of overload. Tests at −2° F to +136.4° F show only a few seconds difference in tripping time. That's the kind of overload protection you need . . . you get it only with Monitor.

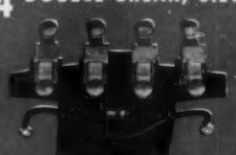
2 TAMPER-PROOF PROTECTION

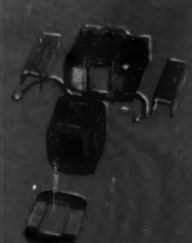
The Monitor Starter Button mechanism is designed to prevent workmen from "blocking-in" the button in order to keep the motor running regardless of overload. The button must be pressed in and then released to make contact.

3 VERTICAL STRAIGHT-LINE DESIGN

A design introduced by Monitor nearly 50 years ago.

4 DOUBLE-BREAK, SILVER CONTACTS

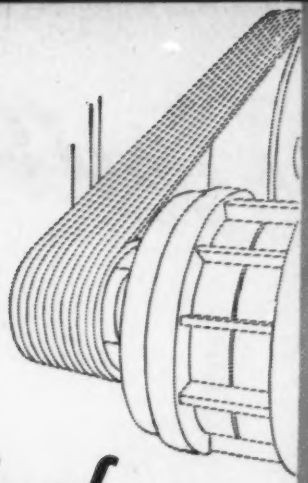




5 INTERCHANGEABLE COILS

6 RESILIENT, SHOCK-PROOF MOUNTING

The Monitor Controller Company
GAY, LOMBARD & FREDERICK STS. BALTIMORE-2, MARYLAND

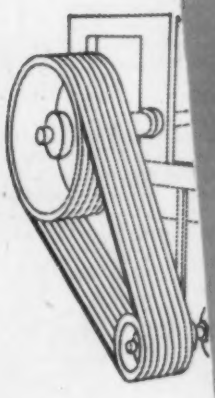


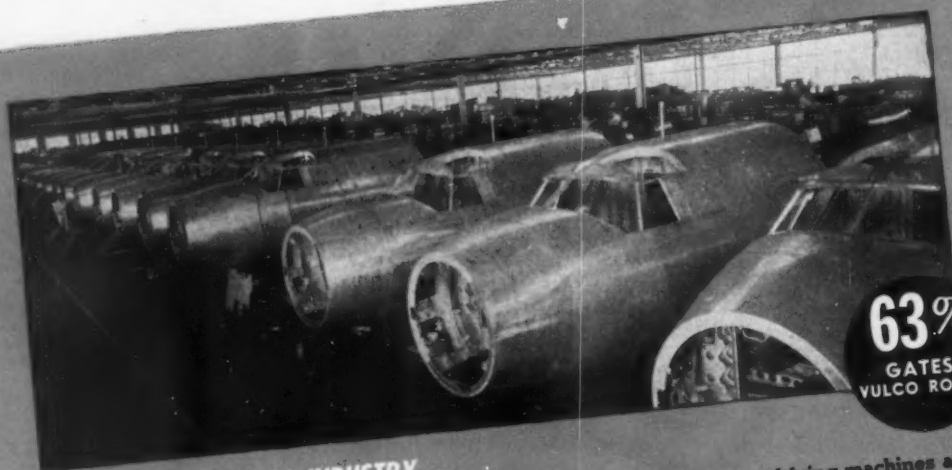
Thousands of

GATES VULCO ROPES

BOULDER DAM

Back in 1935 when Boulder Dam was still the biggest thing mankind had ever built, Gates Vulco Ropes were already first choice of America's leading Engineers. More than 92% of all V-belts used in building Boulder Dam were Gates Vulco Ropes.





AMERICAN AVIATION INDUSTRY

In 8 of America's largest aircraft-producing units, 63% of all the belts now driving machines are Gates Vulco Ropes. Where belts are subjected to severe heat and oil conditions, Gates has supplied the aviation industry with thousands of special heat and oil resisting belts. These belts, made of a special synthetic rubber, withstand severe heat and oil conditions twice to three times as long as V-belts made with natural rubber.

PENNSYLVANIA TURNPIKE

Built by 155 contractors from 18 different States—yet more than 87% of all the V-belts used were Gates Vulco Ropes.

GREAT CENTRAL VALLEY—California

In many ways the greatest project of all—and, here again, 94% of the V-belts selected were Gates Vulco Ropes.

GRAND COULEE

Gates began supplying industry with V-belts made entirely of synthetic rubber in 1938—just when the first big units of Grand Coulee were nearing completion. On this mammoth engineering project, Gates Vulco Ropes totaled more than 76% of all the V-belts used.

COLORADO RIVER AQUEDUCT

American Engineers once more gave Gates Vulco Ropes predominantly first place. To build 91 miles of tunnels, 60 miles of canals, 56 miles of conduit, 9 immense aggregate plants and a diversion dam 320 feet high, 85% of the V-belts chosen for the work were Gates Vulco Ropes.

---in America's Greatest Industrial Projects—
Have Been Made Entirely of
Synthetic Rubber

It is no accident that GATES — the World's Largest Maker of V-belts—began supplying industry with thousands of V-belts made entirely of synthetic rubber *5 years before* anyone could know that supplies of natural rubber would be cut off by war.

The Gates synthetic rubber V-belt—now thoroughly tested by *years*, not *months*, of service—was in no sense developed as merely a "substitute" for rubber. It was designed to be—and in certain important applications it has *proved* itself to be—greatly *superior* to belts of natural rubber.

There is this to be kept always in mind concerning rubber:—A tree can make only one kind. In synthetic rubbers we have the choice of *many* kinds. Gates uses each kind where it best meets some particular service need.

In the Gates Special Heat and Oil Belt, for instance, a *very special kind* of synthetic rubber is used. This special synthetic rubber has the ability to withstand heat and oil much better than natural rubber can.

You know, of course, from every day experience, that your Standard Gates Vulco Ropes withstand exposure to heat and oil very well. It is when the heat or oil conditions become *excessively* severe that the Gates *special* synthetic V-belt, at a little higher price, has proved its ability to give *very much longer* wear than any other V-belt you can use.

Beyond any question, Gates has had *longer* experience and *more successful* experience in the fabrication of synthetic rubber V-belts than *any other* manufacturer.

To know of this will be to your advantage —particularly NOW when Gates' unequaled experience in making synthetic rubber V-belts can be put to use right in your own plant. You have only to look in your telephone directory and call the Gates Field Engineer. He will put at your service the full benefits of Gates' knowledge and experience *without the slightest obligation.*

THE GATES RUBBER COMPANY

439

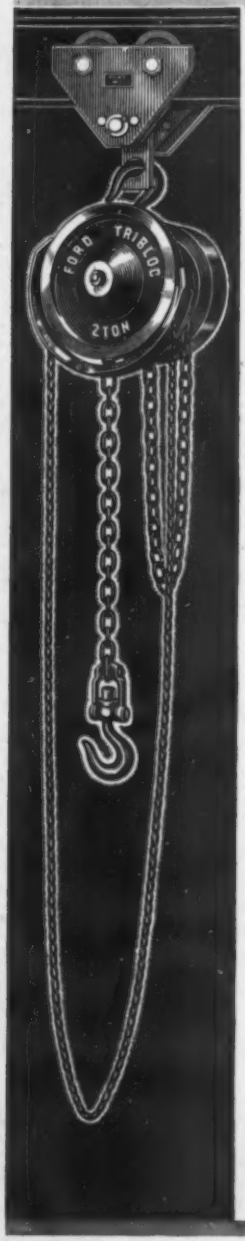
Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO, ILL. 549 West Washington
NEW YORK CITY 215-219 Fourth Avenue
ATLANTA, GA. 738 C. & S. National Bank Building
LOS ANGELES, CAL. 2240 East Washington Boulevard
DENVER, COLO. 999 South Broadway
DALLAS, TEXAS 2213 Griffin Street
PORTLAND, ORE. 333 N. W. 5th Avenue
SAN FRANCISCO, CAL. 1090 Bryant Street

Here's How!

TO LUBRICATE YOUR FORD TRIBLOC



FORD TRIBLOCS withstand abuse amazingly well—but this is certainly no time to abuse anything made of critical materials. Like any other precision-made machine, **FORD HOISTS** will give more efficient service for a longer time if properly maintained. In **FORD HOIST** maintenance, lubrication is perhaps the most important single factor—so here are a few pointers on lubricating **FORD TRIBLOCS.**

- The gear cover should be removed occasionally and a small quantity of suitable graphite grease applied.
- The load chain should be lubricated frequently with a heavy oil, particularly at engaging points of links.
- Load sheaves should also be greased.
- Oil the bearings frequently so that no bearing will run dry and cause excessive wear.
- Oil holes are provided in the **TRIBLOC** at vital points. These should be used frequently.

When given intelligent care, lubricated thoroughly at intervals, **FORD TRIBLOCS** will remain efficient under the hardest usage for a long time. Your **FORD HOIST** can be one of your best friends during this production emergency. Take care of it.

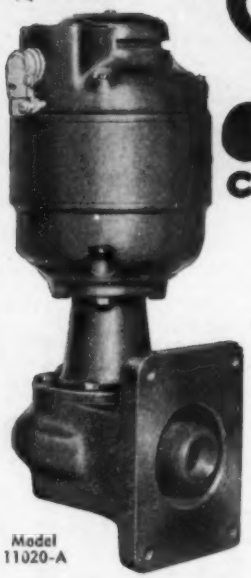
FORD CHAIN BLOCK DIVISION

PHILADELPHIA • CHICAGO
DENVER • LOS ANGELES
SAN FRANCISCO
PORTLAND

ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

HIGH FLUSHING CAPACITY with GUSHER COOLANT PUMPS



Model 11020-A

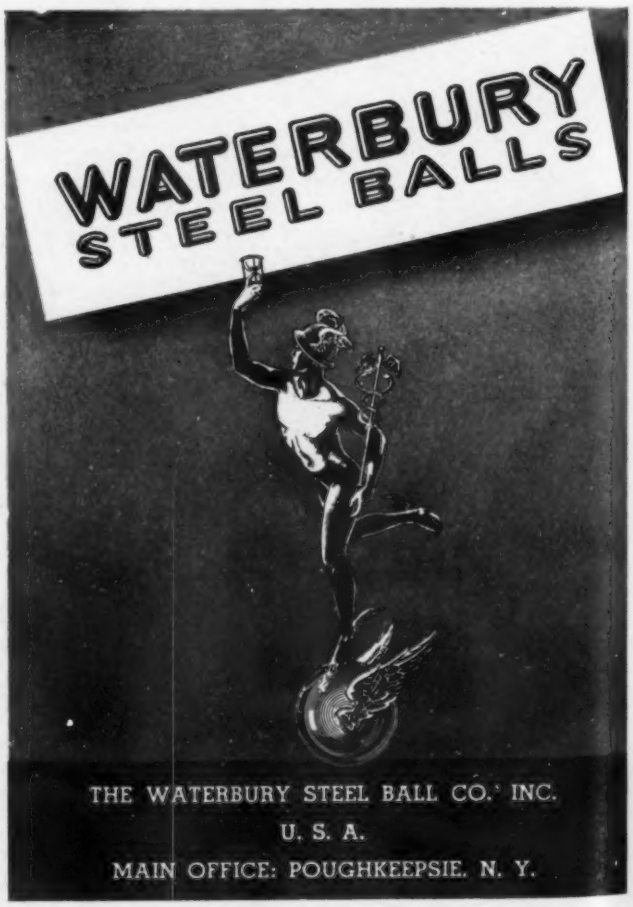
And yet, you can cut down the flow to a mere dribble without building pressure.

Gusher Coolant Pumps are being used by leaders in the industry for grinding, honing, cutting, milling, tapping and threading.

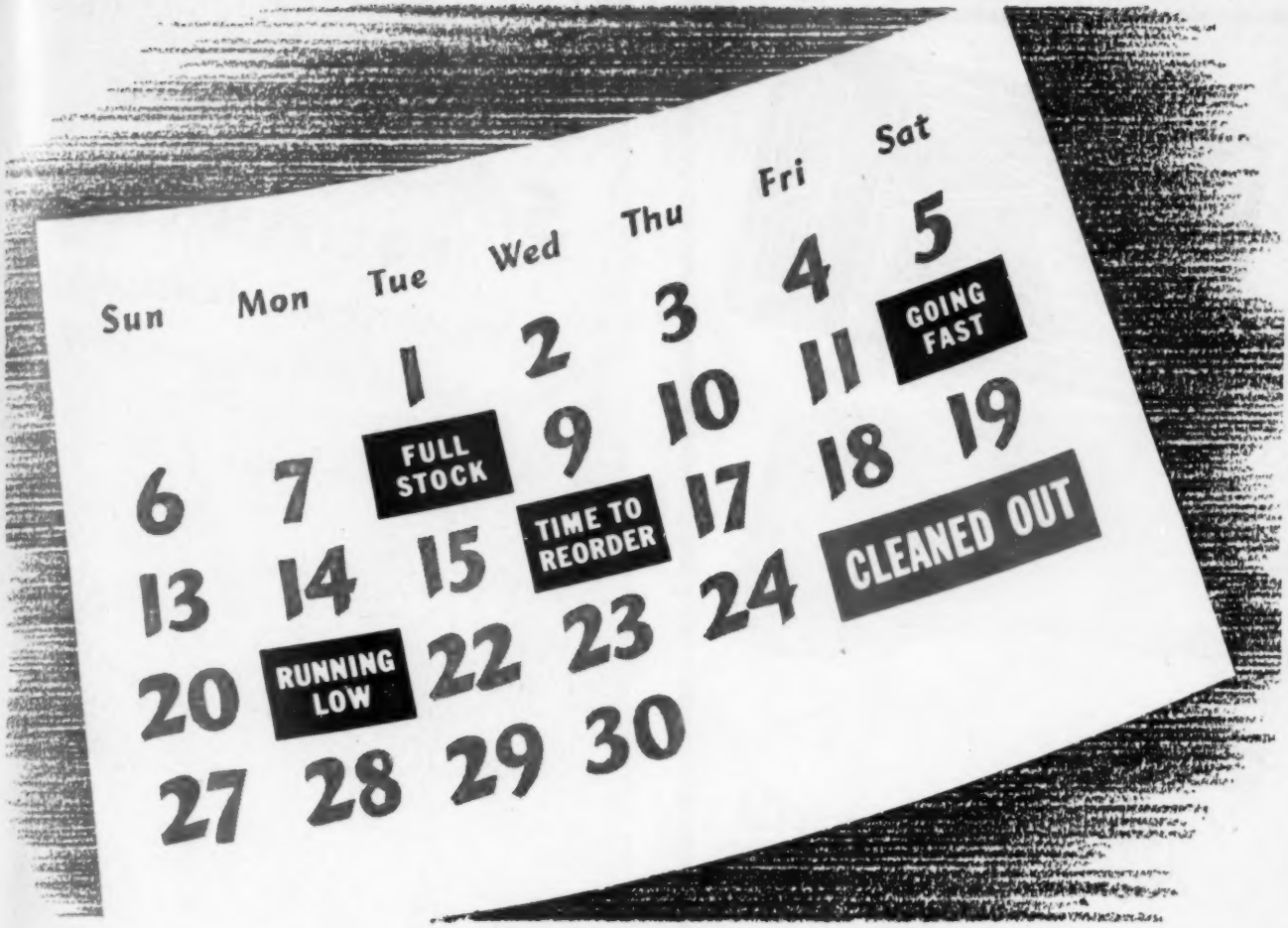
Learn the exclusive advantages of Gusher Coolant Pumps. Sizes and types from 1/10 to 2 h.p.

Write for data and specifications.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI, OHIO
Largest Exclusive Builders of Coolant Pumps



THE WATERBURY STEEL BALL CO., INC.
U. S. A.
MAIN OFFICE: POUGHKEEPSIE, N. Y.



Running low on supplies?

Telephone your ISD *first!*

An empty stock bin is like an empty gauge glass on a boiler—warning ahead of plenty trouble quick. How about *your* supplies—do you have enough help in keeping reserves at a safe level? It's wise to guard against shortages in advance—telephone your Industrial Supply Distributor *first!*

For he knows—if you have given him the chance to keep informed—what materials you are going to need, and when. He orders ahead for you—enough to keep you going, even if not a full supply. He does his best to make spot deliveries—usually he succeeds.

Your Distributor has access to the same manufacturing sources that your own Purchasing Department has. He buys in volume—he is an important customer. He buys on the same high priorities that you do—and when his orders go into the factory schedule, no other orders of equal priority can bump them off.

For the sake of your own production schedules and your peace of mind as well—telephone your Industrial Supply Distributor *first!*

ARMY NAVY

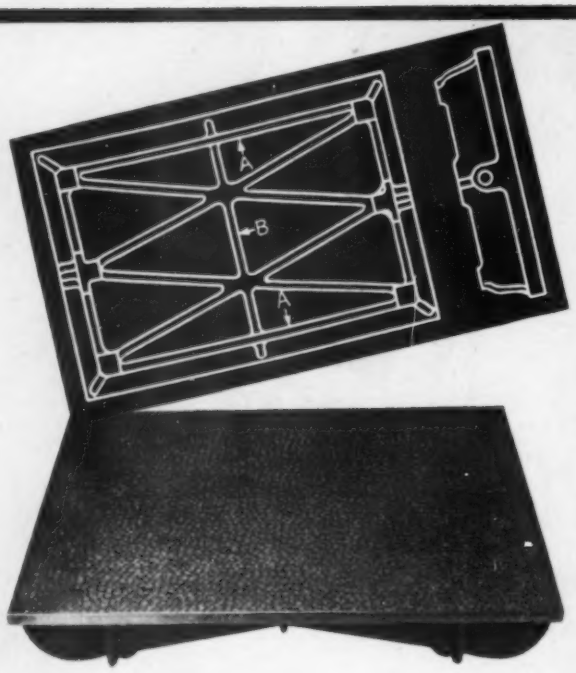
ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU



Precision Measurements

CAN BE MADE

ANYWHERE

ON THIS

SURFACE PLATE

From the center to the very edge—the entire surface of this plate spells precision. The special form of ribbing that supports this plate assures resistance to deflection under load. Special pedestal stands have been designed for larger sized plates to guard against distortion. Adjusting and leveling screws locked to a fixed position are provided at several contact points—the plate always remains uniformly level, undisturbed by vibration. Ample clamping space is provided all around the edges.

Sizes of these plates—all precision scraped—range from 72 x 168 inches down to 10 x 15 inches, including one heavy duty plate measuring 20 inches in depth for extremely heavy load requirements, with surface area 4' x 6'.

BUY WAR BONDS

MACHINE PRODUCTS CORPORATION

6709 E. McNichols Road • Detroit 12, Mich.

The *new* CM Meteor heavy-duty wire rope electric hoist is industry's newest recruit for speeding-up production. It is designed, engineered and built to answer the nation-wide demand to produce more and faster. Featuring true balance, streamlined design...aeroplane type cooling...helical gears and one point lubrication, the CM Meteor provides fast materials handling with complete safety. Compact...low head room ...readily adaptable to present systems. Only 110 volts pass through the push button station. The Meteor really *smashes* bottlenecks by speeding up materials handling.

Completely illustrated engineering Catalog No. 142 in color, showing details, specifications, applications and point by point advantages of the CM Meteor will be sent on request. Write:

CHISHOLM-MOORE HOIST CORPORATION

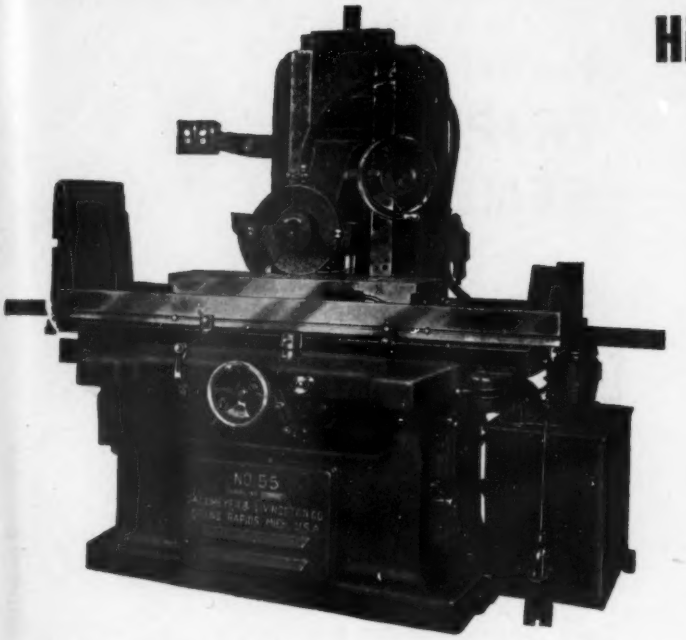
(Division of Columbus-McKinnon Chain Corp.)

120 FREMONT AVE. TONAWANDA, N. Y.

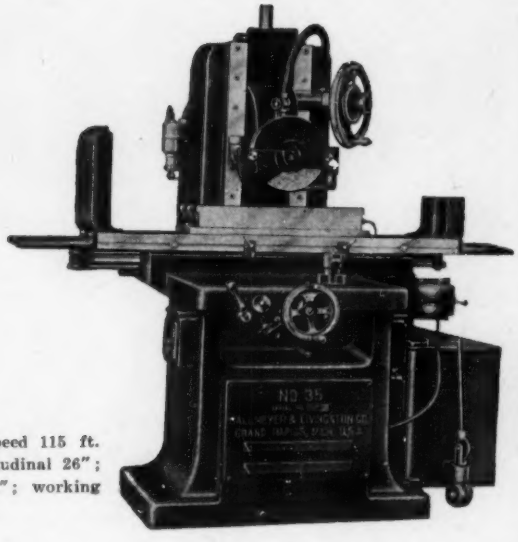
Branch Offices: NEW YORK • CHICAGO • CLEVELAND

Grand Rapids

High Speed – Precision Type
HYDRAULIC FEED SURFACE GRINDERS



No. 55 maximum longitudinal table speed 125 ft. per min.; automatic table travel, longitudinal 38"; automatic table travel, transverse 13½; working surface of table 12" x 36".



No. 35 maximum longitudinal table speed 115 ft. per min.; automatic table travel, longitudinal 26"; automatic table travel, transverse 9¼"; working surface of table 8" x 24".

SMOOTH • FAST • CONVENIENT

for TOOL ROOM or PRODUCTION LINE

Grand Rapids High Speed Hydraulic Feed Surface Grinders embody design, construction and operating features that have been developed over a period of thirty-six years of specialization in the development of fine quality surface grinding machines.

These units offer the maximum in speed and smoothness. In addition to the two sizes shown, they are built in the following models and automatic longitudinal table travels: No. 25-20"; No. 38-38"; No. 45-26" and No. 65-50".

Features include the massive, sturdy "Grand Rapids" one-piece column and base—a construction which assures absolutely permanent alignment of cross travel and upright head ways.

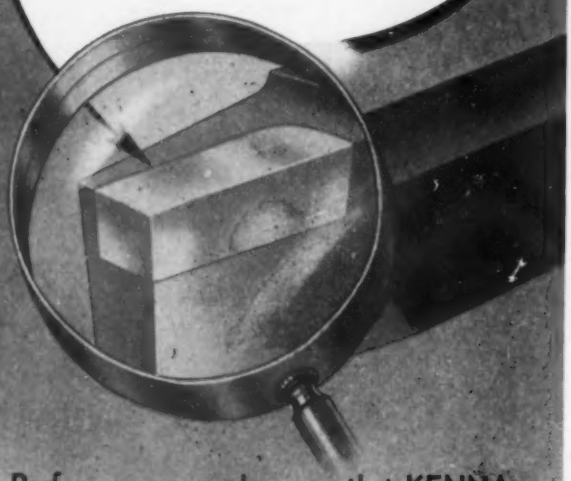
Whatever your tool room or production surface grinding problem, it will pay you to get in touch with "Grand Rapids." Outline your requirements and you can be assured of our assistance.

Send for Bulletin GL 100 giving detailed specifications of "Grand Rapids" High Speed Precision Type Hydraulic Feed Surface Grinders.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

Double YOUR PRODUCTION WITH THIS SMALL PIECE OF METAL



Performance records prove that KENNAMETAL steel-cutting carbide tools are increasing the production of machined steel parts. This is because the great strength of these tools permits them to be used at heavy feeds while maintaining high cutting speeds.

KENNAMETAL will machine steel heat-treated up to 550 Brinell, at speeds from two to six times faster than high speed steel and with ten to fifty times more pieces per grind of tool. In addition to cutting down machining time, the ability of KENNAMETAL to machine steel in the hardened state in many cases eliminates the time-consuming annealing operations.

If you machine steel parts, the greater strength of KENNAMETAL carbide tools will increase the output of your shop. Write today for the KENNAMETAL Catalog 43B containing latest prices and styles of carbide tools and blanks.

KENNAMETAL THE All American CARBIDE

KENNAMETAL Inc.

103 LLOYD AVE., LATROBE, PA.

Trade Mark Reg. U. S. Pat. Off. Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)

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1. CUT FRICTION.

2. CUT JOB DELAYS.

3. CUT HIGH COSTS.

You Get These

TRIPLE BENEFITS

with IDEAL

"TRIPLE-DUTY" LIVE CENTERS

Take Heavier Loads and Deeper Cuts at Higher Speeds!

Get more work faster, out of lathes, millers, grinders, etc. with IDEAL Live Centers. Only with IDEAL can you have the many advantages made possible by these three interchangeable centerpieces. IDEAL Live Centers rotate with the work. Use this precision-built Live Center that is accepted as a standard in leading tool rooms and machine shops.

IDEAL METAL ETCHER

Quickly and easily, the New IDEAL all-purpose (portable) Etcher permanently burns important information into smooth-surfaced iron, steel and their alloys. Saves time—prevents mistakes in use of materials, parts, tools, etc. Lessens theft and loss. 14 heat gradations.

IDEAL 3 in 1 "Jumbo" ELECTRIC CLEANER

(1) Blows (2) Vacuums (3) Sprays

Keep machines and motors clean with IDEAL 3 in 1 "Jumbo" Cleaner. Completely removes dust and dirt. Super-powered, heavy-duty, 1 H.P. Motor. Air velocity 24,900 ft. per minute. Wide variety of attachments available.

FREE...

Machine Tool Accessories Catalogue contains detailed information about the above and other Production Speeders. Send for your copy today!

IDEAL Sycamore

★ IDEAL COMMUTATOR DRESSER CO ★

1057 Park Avenue **Sycamore, Ill.**

Sales offices in all principal cities.

Metalmaster

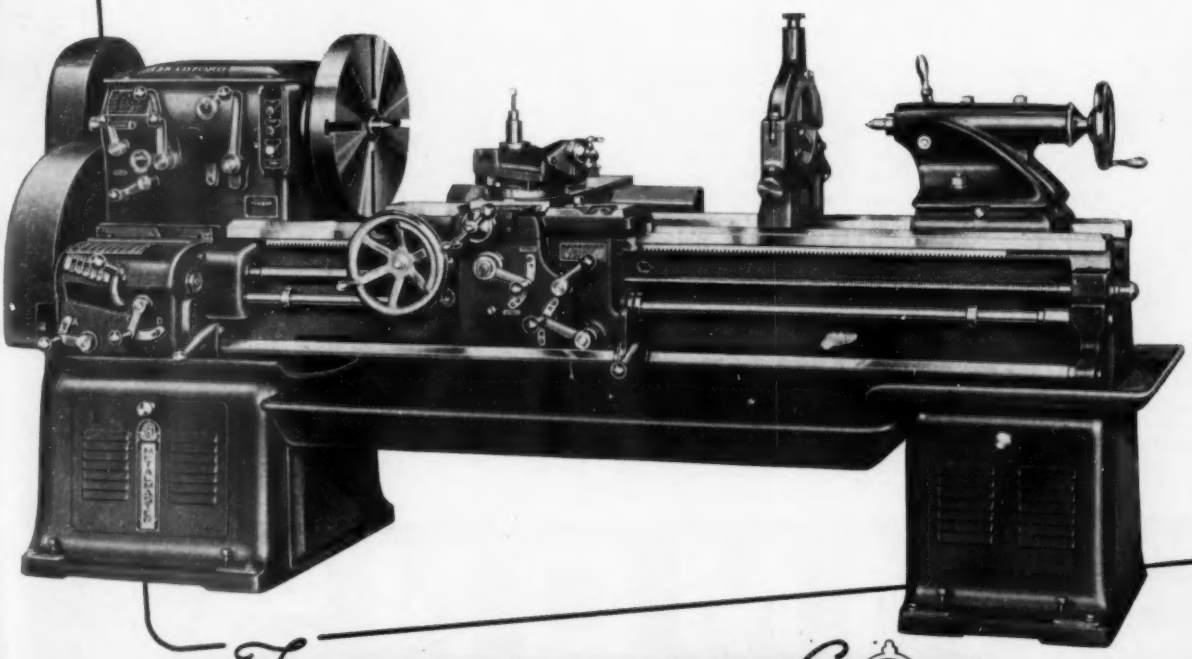
12", 14" and 16" LATHES

Fast, accurate for war production . . . durably constructed, precision built, to stand up under sustained production schedules — these features combine in the METALMASTER to offer the ultimate in a dependable, economical metal working unit.

CHECK THESE FEATURES!

● HEADSTOCK — Heavy walls, sturdy center bracing, twelve spindle speeds, (forward and reverse), alloy steel gears, conveniently located shift handles.
SPINDLE — Machined from solid high-carbon molybdenum steel forgings, bored straight through from end to end . . . large precision tapered roller bearings . . . chuck and face plate is drawn back securely by a locking ring — driven by a large key.
SMOOTH, POWERFUL DRIVE — "V" belts insure quiet, efficient power delivery . . . multiple disc clutch operates completely immersed in oil. Jogging, with motor running at high speed, is entirely possible. Clutch and brake are completely adjustable. Drive sheave is mounted on precision-tapered roller bearings.

These are but a few of the outstanding advantages offered by the METALMASTER. To get the full picture write today for detailed data on the METALMASTER . . . we'll send information on its design, construction and how best to use it, so as to achieve the most from its superior operation characteristic. By giving you this information we feel that we can be of the most help to you in saving, serving and speeding the ultimate Victory.



The BRADFORD MACHINE TOOL Co

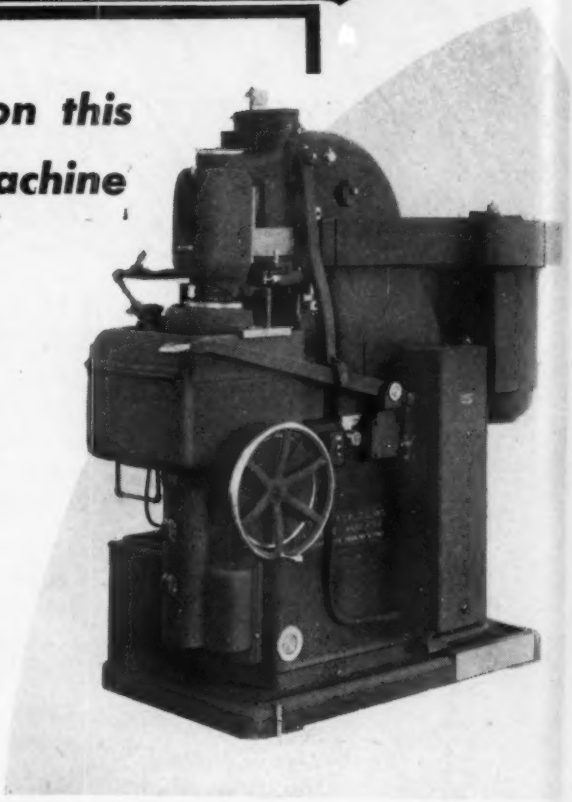
MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

WALKER Improved ROTARY SURFACE GRINDER

BIG SAVINGS are possible on this highly productive, accurate machine

Extreme accuracy, ample power and great rigidity are combined with convenient operation and easy adjustment in this modern, improved single stroke machine. It is designed not only for high production operation but also for handling a wide range of work.
The work table assembly can be tilted as much as 5 deg. for hollow grinding saws and cutters having hubs up to 6 in. in diameter.
Head can be raised or lowered quickly. It is brought down to a stop, locked in position and the table raised and lowered by large handwheel on the right hand side. Index pointers enable the operator to set the wheel to remove a given amount of stock. An adjustable pointer permits bringing the work into position to reproduce the thickness of previous parts ground.
Other features include: spindle driven from 10 HP motor mounted on back of column; table drive provided by separate 1½ HP motor at rear of machine; six table speeds.
All these and other interesting and important details are fully described in literature available promptly on request. Write today!



EXPLORE THE POSSIBILITIES OF THIS MACHINE

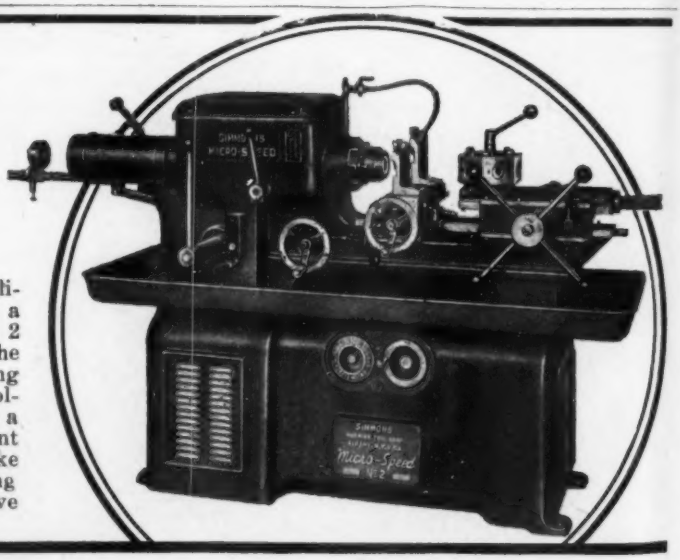
Walker engineers are ready at all times to assist you to effect savings on your surface grinding operations. Outline your problem and ask us to show you how this improved machine will cut your costs.

O. S. WALKER CO., INC.
WORCESTER MASS.

a BEST BET!

SIMMONS NO. 2 TURRET LATHE

- MICRO-SPEED DRIVE
- SELECTOR DIAL CONTROL
- SPINDLE BRAKE & CLUTCH



RECENTLY the editor of a leading metal-working publication specializing in screw machine operation visited a plant employing several batteries of Simmons No. 2 MICRO-SPEED Turret Lathes. "We were amazed," he wrote, "at the number of diversified parts that were being turned out on these machines with very little special tooling items in use. Many of the turret lathes did not have a 'special tool' in their entire set-up." Whether your plant is wholly engaged in war work or continues to make standard products, Simmons Turret Lathes, producing close-tolerance work speedily and economically, will prove a production standby.

The MICRO-SPEED Drive offers unlimited speed variations and all changes can be made while the spindle is in operation. This enables quick selection of the speed best suited to the work and cutting tools. **ASK TODAY for details and delivery dates.** SIMMONS MACHINE TOOL CORPORATION. Main Office: 1759 North Broadway, Albany, 1, N. Y. *New York Office:* 149 Broadway.

SPECIFICATIONS
Bar Capacity—1¼"; Swing over bed—14"; Swing over cross-slide—6".
Made in Plain and Back-geared types (latter shown in illustration)

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

ARE YOU

GETTING COMPARABLE SPEEDS ON LARGE SCALE MAINTENANCE THREADING?

IF NOT

GET AN OSTER

"WILCO"

OSTER "WILCO" PIPE THREADING SPEEDS!

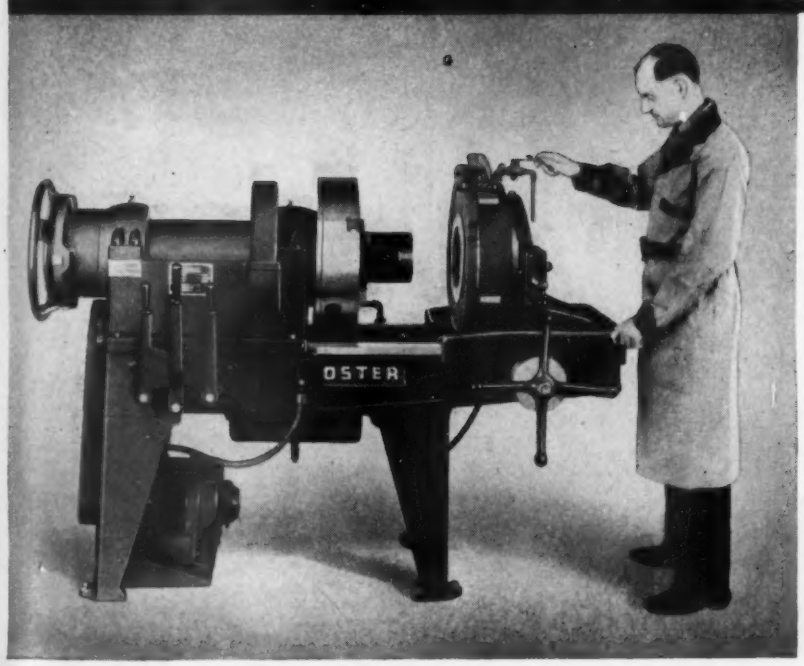
No. 704 "WILCO"

Pipe Size	*Threading Time*
1"	16 seconds
1¼"	16 seconds
1½"	24 seconds
2"	25 seconds
2½"	38 seconds
3"	40 seconds
3½"	56 seconds
4"	58 seconds

No. 706 "WILCO"

Pipe Size	*Threading Time*
1½"	19 seconds
2"	20 seconds
2½"	30 seconds
3"	31 seconds
3½"	48 seconds
4"	49 seconds
5"	70 seconds
6"	74 seconds

Note: Above time studies based on cutting full American National Standard pipe threads at recommended speeds.



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Maximum Gear Diam.	10"	10"	18"	18"
Max. Length between Centers	11"	11"*	14"	14"
Distance between upper and lower spindle	1¾" to 5½"	2½" to 5⅝"	3¼" to 10¾"	3¼" to 10¾"
Gears with Stems		½" to 1½" Dia. of stem		½" to 1⅞" Dia. of stem
Spindle R. P. M.'s with Standard pulleys	500, 800, 1050 and 1600		750, 1150, 1550 and 2300	
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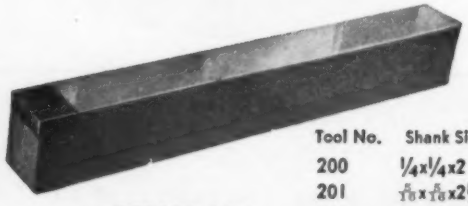
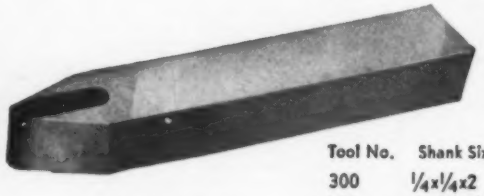
Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

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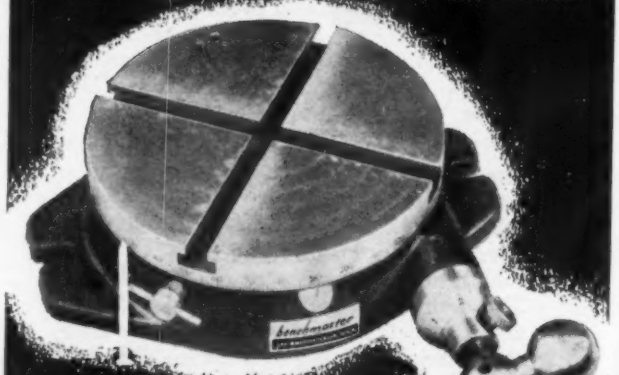

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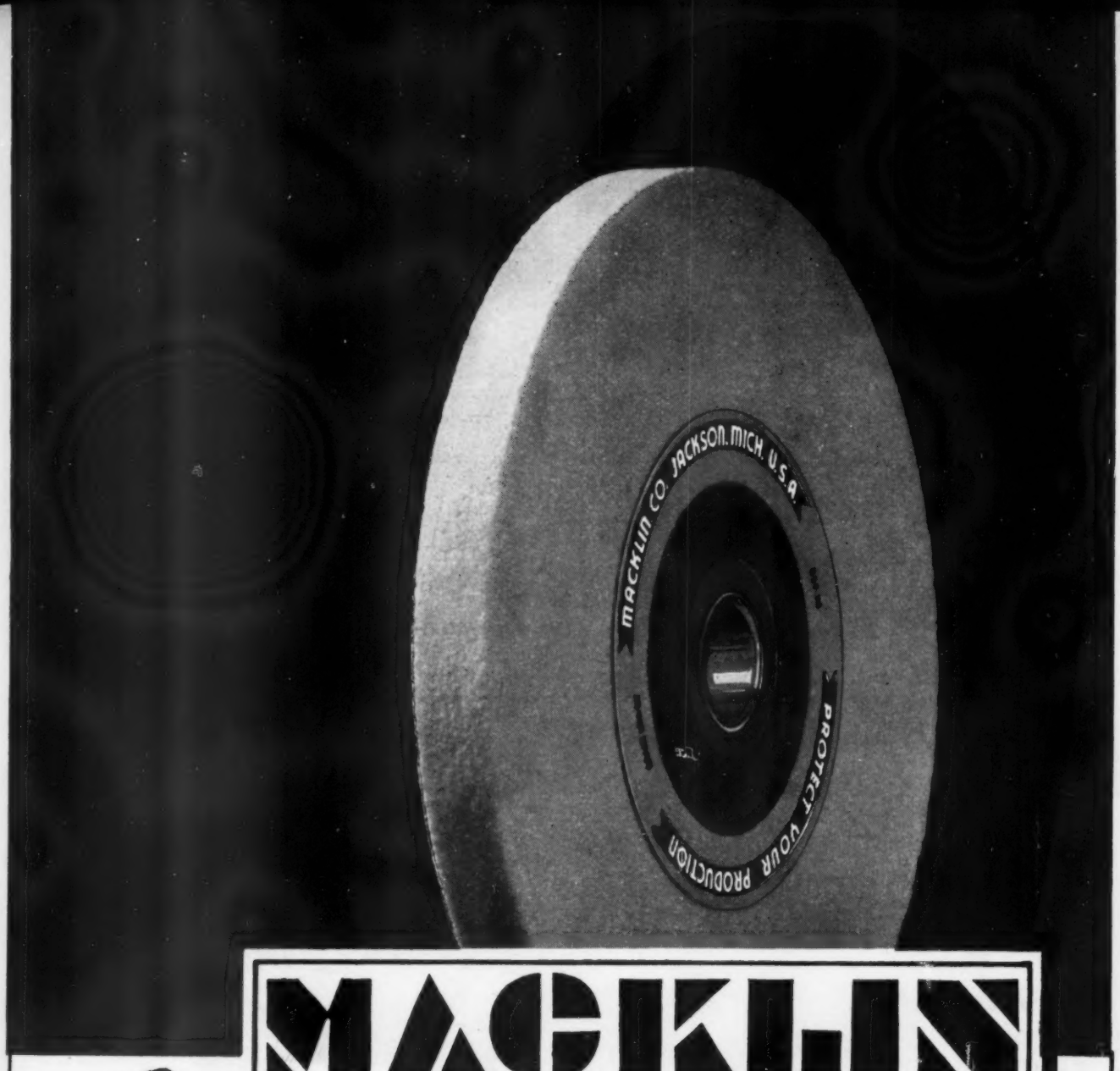

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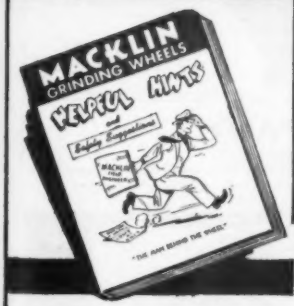

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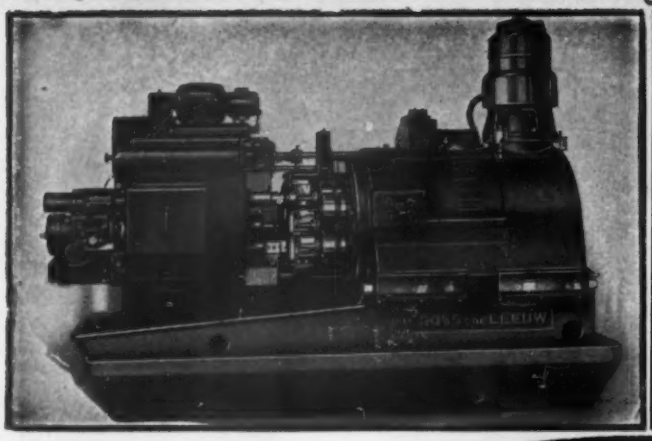

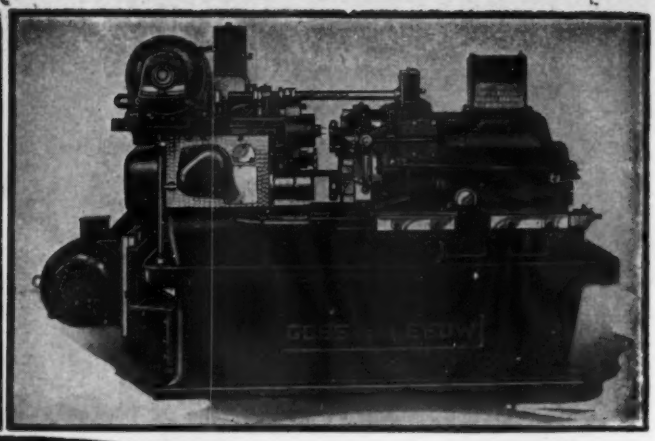

WORK ROTATING TYPE

5 Spindles
6 Spindles
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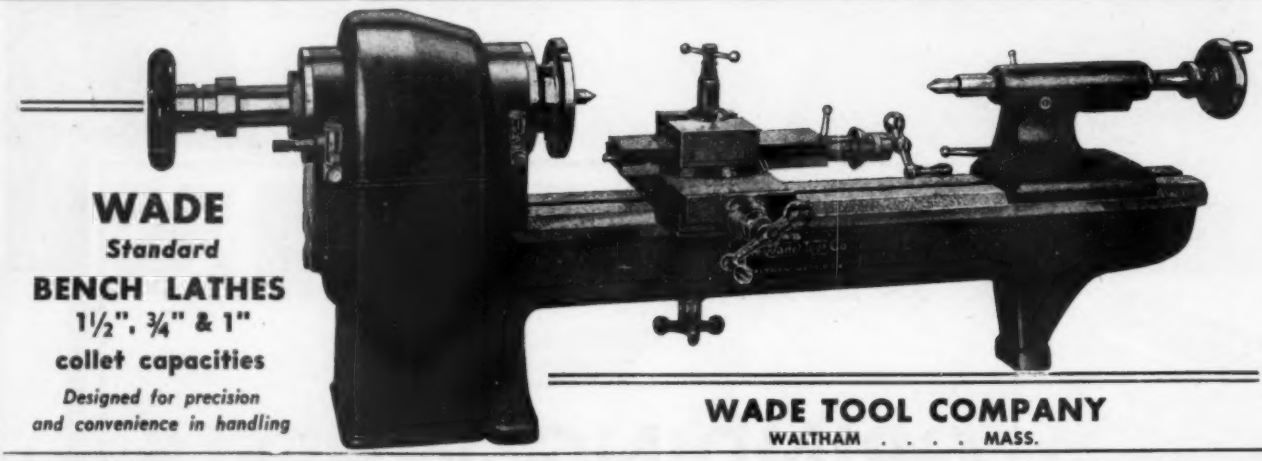

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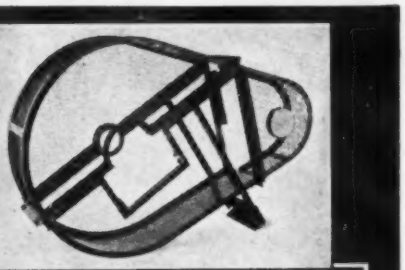

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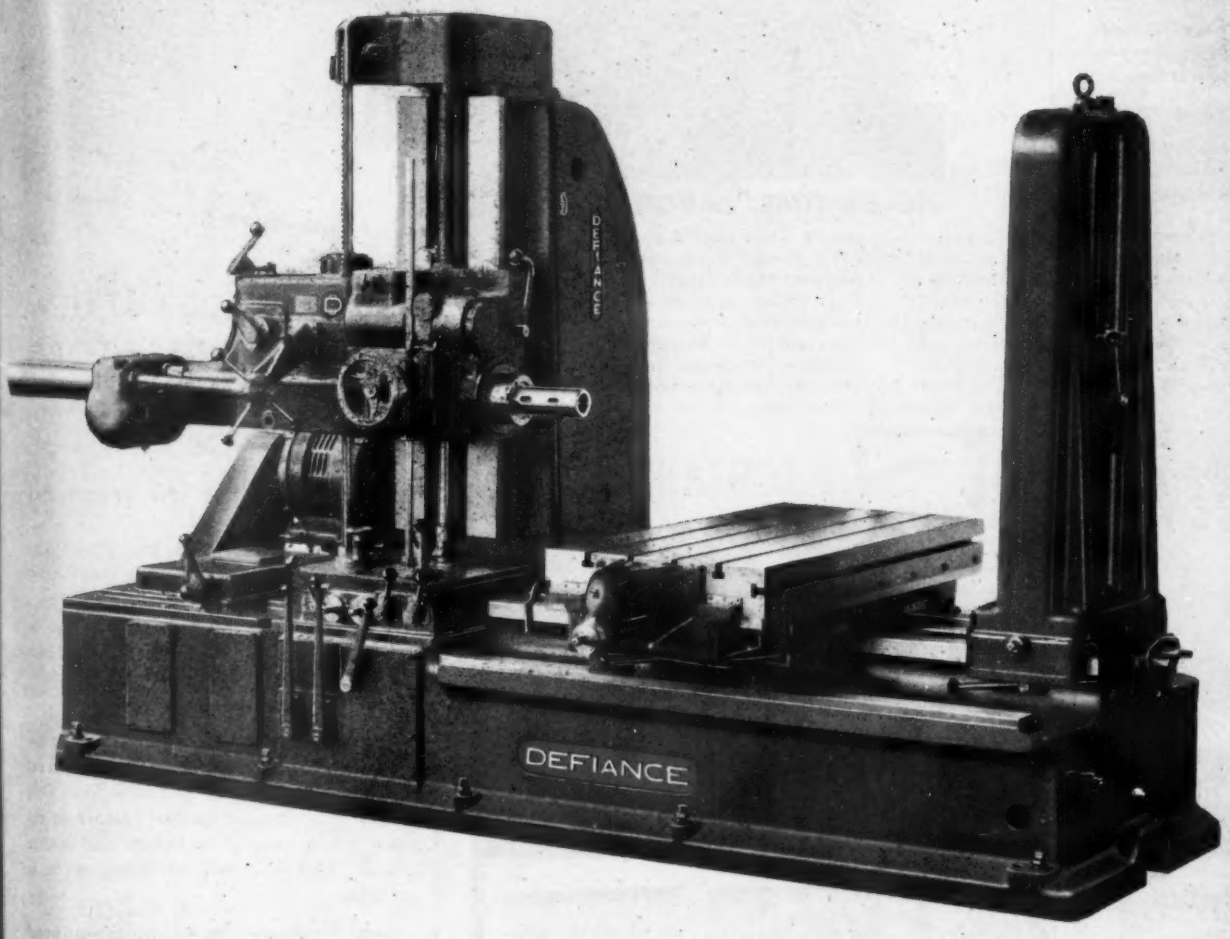

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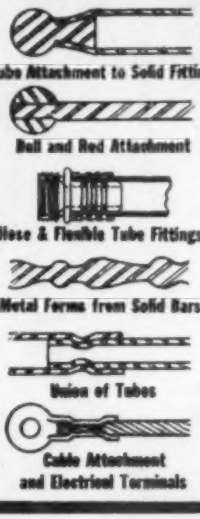
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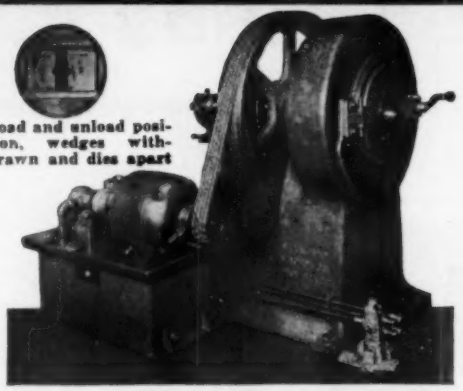

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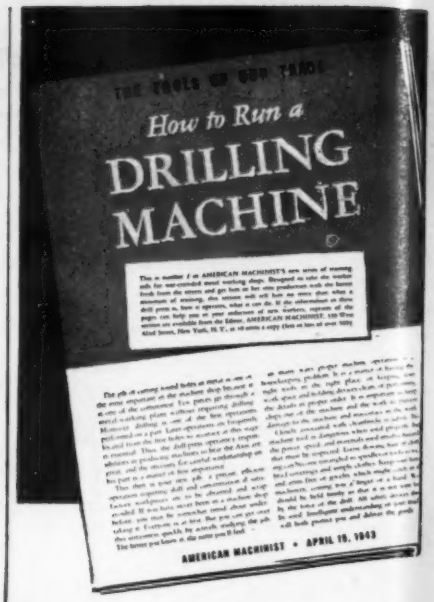

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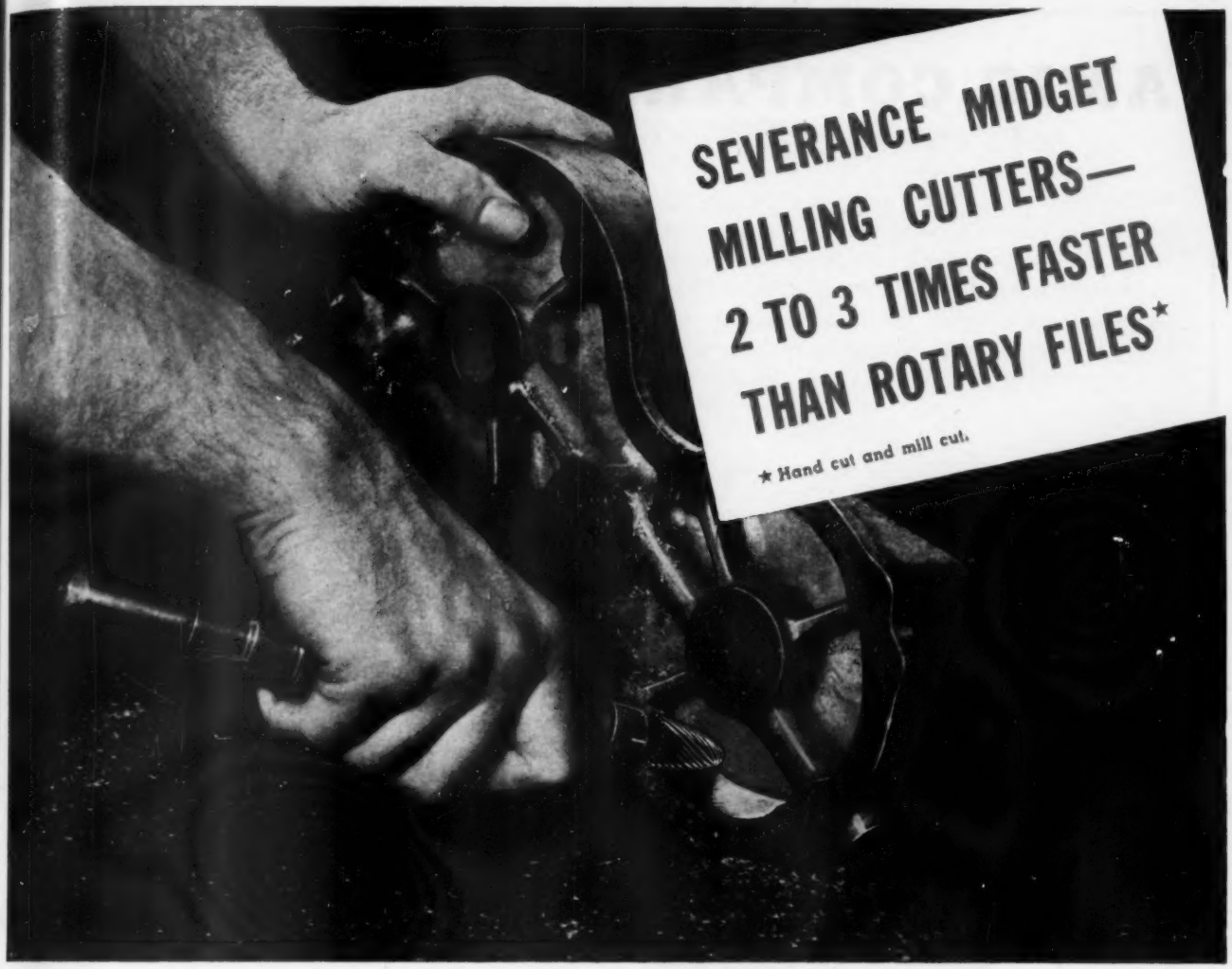

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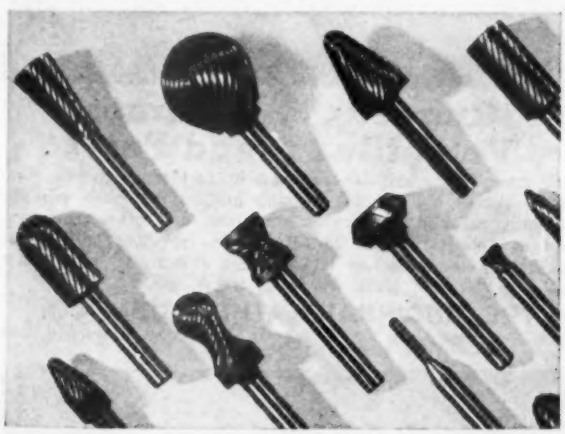

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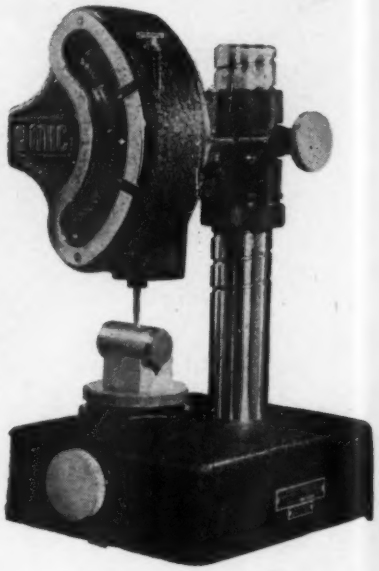

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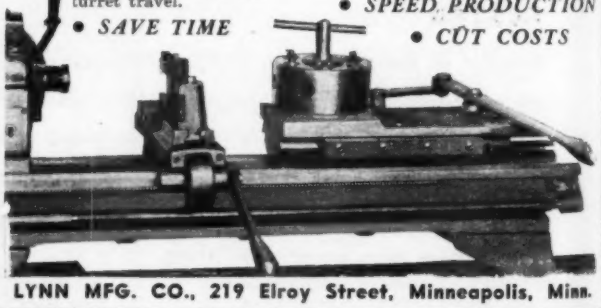

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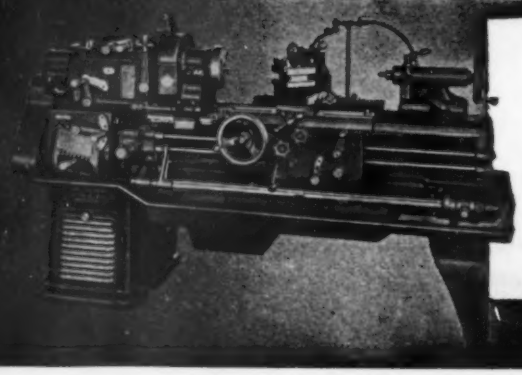

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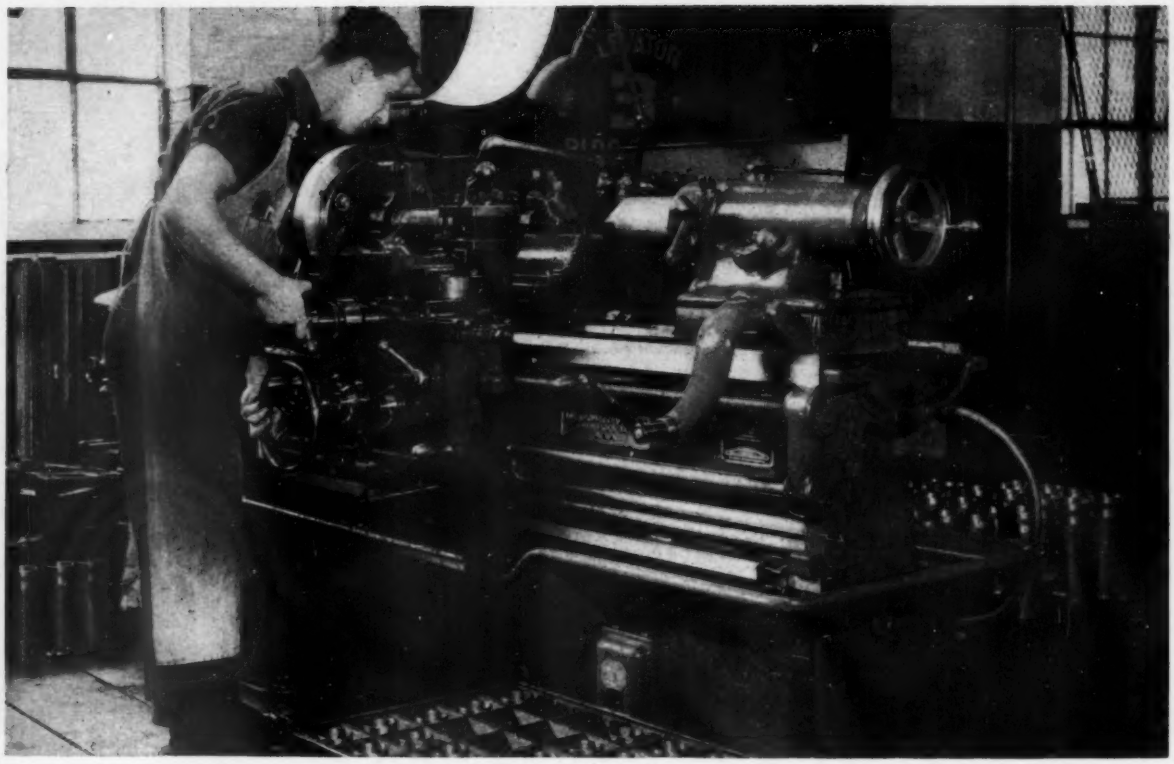

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"Table top is of hardened steel and ground. Milled guides are provided parallel to face of wheel in which the protractor guide slides. Table is supported by a heavy, bronze elevating screw with handwheel. Table may be raised or lowered approximately 2" from center of wheel. Angular adjustment up to 35° may be obtained in all planes.

A free hand grinding method is provided. Tool is held against protractor guide and thus directed against wheel at the proper angle.

Special wheels for this machine are available for grinding high speed steel or special alloy tools.

Condensed Specifications

Height to center of spindle: 36¾"
Bottom of pan to center of wheel: 10"
Pan: 37"x22½"x6"
R.P.M. spindle: 1000 optional
Dia. spindle in bearing: 2"
Bearing pillow block Timken tapered roller bearing equipped
Base: 28"x27½"
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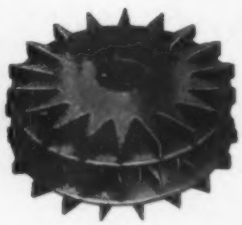

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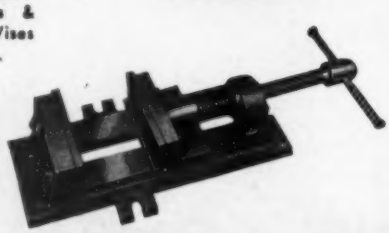
A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.

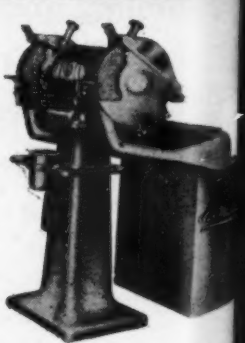


Write for copy of catalog "A" and name of your nearest dealer who can supply you.

ARMY E NAVY

THE
DESMOND-STEPHAN MFG. CO.
URBANA • OHIO

For Want of a Nail . . .



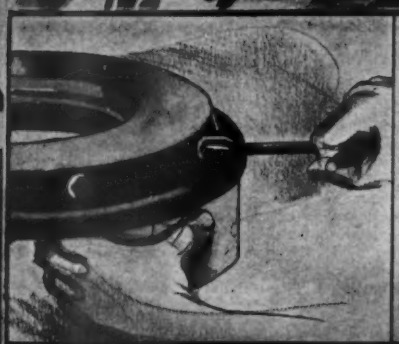
It's true that sharp tools cut production costs. But efficiency slumps when the same tools that put sharp edges on cutting tools spew out abrasive grit and dust to attack close-fitting parts of costly machinery.

For want of a nail, a shoe was lost. For want of a way to halt the attacks of grit and dust on machinery—and on workers' lungs, too—vital production can suffer.

The Cincinnati Air Master—easily cleaned, easily installed and built in three sizes to fit all grinders and buffers—will solve this problem by trapping grit and dust at their source. Write for complete information.

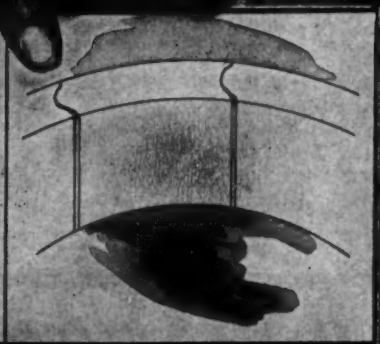
The Cincinnati
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOL
The Cincinnati Electrical Tool Co.
2674 MADISON

Here's Why I Like STERLING CHUCKS & SEGMENTS



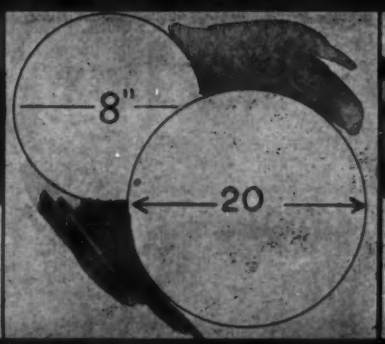
Patented Sterling features provide quick, easy assembly of segments in rigid, long-lasting position in the chuck.

Lack of gaps between segments results in no-chop, continuous shearing action. Quicker, more accurate grinding!

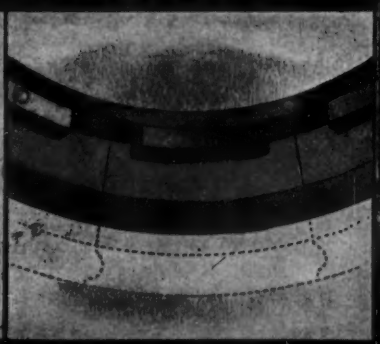


Sterling's interlocking segment design makes for added strength; also retains more coolant than open types.

Sterling No. 2 Segments wear down to the last useful inch. More grinding from the same segments ... lowered production costs!



Sterling No. 2 Chucks and Segments are available in sizes to fit machines using assemblies from 8-inch to 20-inch, inclusive.



The hold of a Sterling No. 2 Chuck on a worn segment is the strongest and best. Safety increases rather than diminishes!

WRITE TODAY!

This new Sterling No. 2 Chuck and Segment Folder outlines many additional features. Send for it!

• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

YOU NEED THIS WRENCH

SPEEDS WORK

because it tightens nuts quicker . . . cannot slip off nuts . . . operates in narrow spaces . . . is instantly reversible . . . prevents chewed nuts and skinned knuckles.

The only socket wrench that accommodates *two different sizes of nuts* in each head.

PROMPT DELIVERIES

Our expanded manufacturing facilities enable us to ship essential orders promptly. Made with 3 sizes of handles; each handle takes 5 different heads; each head fits 2 different sizes of nuts.

GREENE, TWEED & CO.

Bronx Blvd. at 238 St., New York 66, N. Y.

* Reg. U.S. Pat Off.

FAVORITE*
Reversible Ratchet Wrench

IT TAKES NO SKILL TO SHARPEN **BOKUM TOOLS**

RESHARPENING NEVER CHANGES THEIR FORM

It's the unusual design of Bokum Tools —providing proper angles and clearances—that makes possible increased feeds and speeds for precision boring, bottoming and facing, and internal threading. Available in sizes to bore holes from 3/32" up.

When asking for catalog, specify K-1139 for high speed tools, or K-398 for carbide-tipped tools.

BUY WAR BONDS

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

Precision PAL Gauges

Mechanics will welcome the introduction of the PAL Precision Gauge, with improved feature of close adjustment. The PAL Precision Gauge is a dependable and handy measuring tool and is offered at a very reasonable price. • The PAL Precision Gauge is 10¼ inches in height, has a full 6⅝ inch range. It can be converted from a calibre to a height gauge in ten seconds, and has direct reading inside and outside.

The PAL Precision Gauge has many new features, including the following:—Plastic base, making it lighter and rust proof; cast iron sole plate for longer wear; detachable scriber; swift motion assembler which eliminates all thumb screws; self-locking sensitive adjustment. All wearing edges are hardened.

PAL TOOL COMPANY

2300 EAST THIRTY-FIRST STREET · MINNEAPOLIS, MINNESOTA

NEED SUB-CONTRACTS?

Invesigate the possibilities offered you through the CONTRACT WORK SECTION!

For details, write

CONTRACT WORK DEPT.

American Machinist 330 W. 42nd St., N. Y. C.

PHOENIX ADJUSTABLE LIMIT SNAP GAGE

A Gage with Locking Cams which will stay set

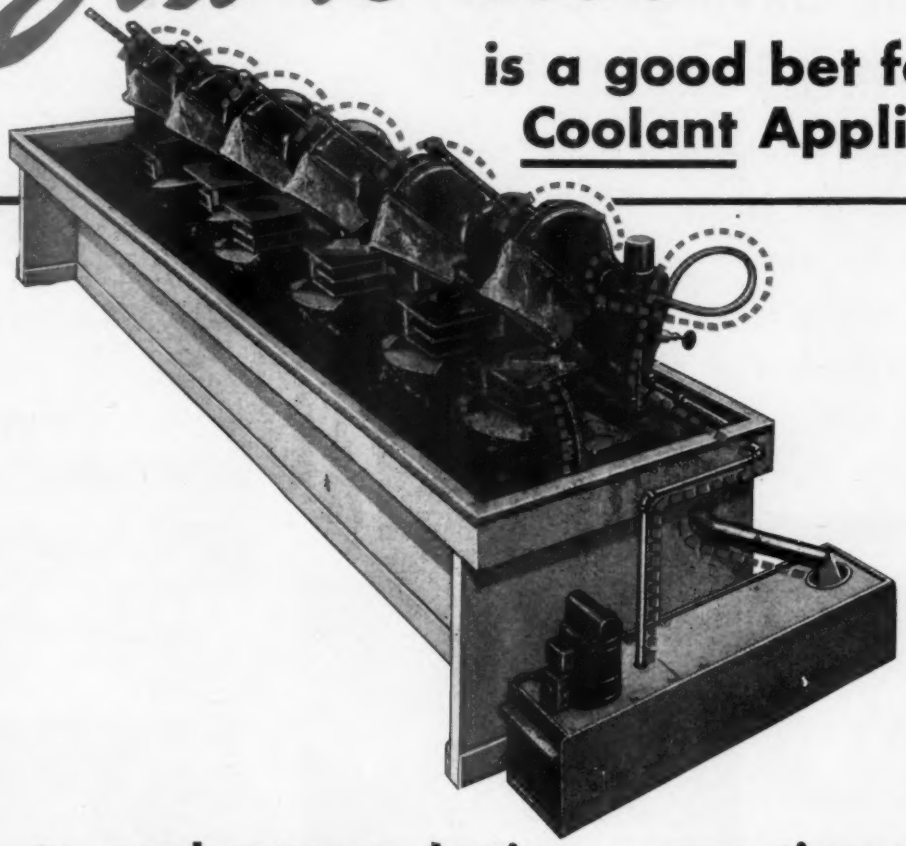
Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N.Y.

Six to one...

is a good bet for Coolant Applications!



Model G-4AX, high pressure, with gear type pump, serving 6 quartz cutting saws. Capacity 150 to 165 g.p.h. Also available, Model G-10AX, centrifugal type, with capacity up to 2000 g.p.h.

... to accelerate production ... save time and tools

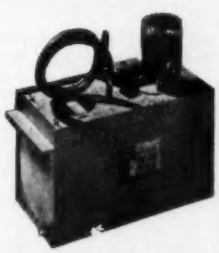
HERE is a picture of efficiency—*plus;* one Hi-Pressure Gray-Mills Portable Coolant System supplies six quartz cutting saws with coolant—assuring faster, better cutting—saving time and tools.

Specially designed for abrasive cutting and grinding operations, this Gray-Mills Portable Coolant System, Model G-4AX, is ideal for the application of coolants where a high pressure, controlled flow is desired. Forced settling of abrasives and grinding dusts is accomplished with baffle plates and special pump filters.

The Gray-Mills, Model G-4AX, is one of a complete line of Portable Coolant Systems that have increased the efficiency of hundreds of machines on operations like drilling, milling, sawing, grinding, honing, tapping, threading and cutting. They are quickly and easily set up to operate either as a permanent or temporary part of a tool. Sturdily built Gray-Mills Coolant Systems are available in both gear and centrifugal types, with capacities from 50 to 2,000-gal. per hour — controlled flow. Prices range from $39.50 to $189.50.

If you want to modernize your older machines—equip small, large or special tools for greater efficiency—or have a "standby" and "cleanout" system there is a Gray-Mills for the job. Call your distributor or write direct.

GRAY-MILLS CO., 227 W. Ontario St., Chicago 10, Ill.



Above: Standard Heavy Duty "A" Series—with large capacity tanks incorporating baffles and screens. Capacities, up to 165 g.p.h.—pressure, 50 lbs. p.s.i.

Below: Model "G" Series—Capacities up to 130 g.p.h.—pressure, 30 lbs. p.s.i.

PROMPT DELIVERIES

Send for new Gray-Mills Catalog—it gives full details.

GRAY-MILLS

Complete Portable Coolant Systems

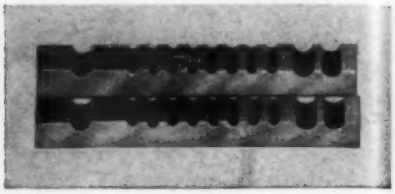
USE GRAY-MILLS COOLANTS . . . 5 types for most requirements—10 and 55 gal. containers—immediate delivery from your distributor or our plant.

DRESSING IS SIMPLIFIED ... *by the New Time-Saving* C-66 ... RADIUS DRESSER FOR SURFACE GRINDERS

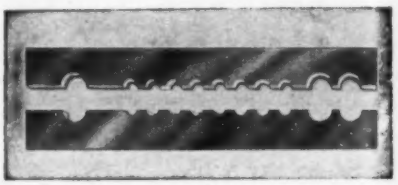
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

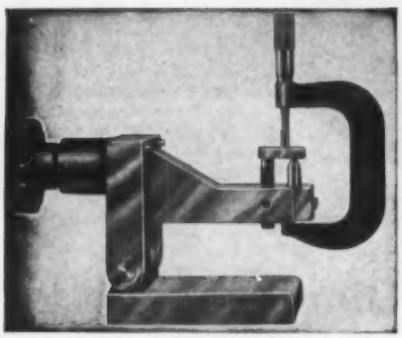
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



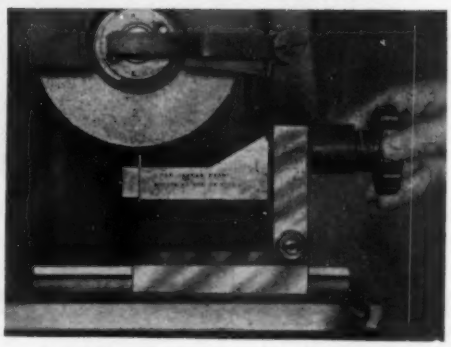
Two High Speed Tool Bits ground for drill jig.



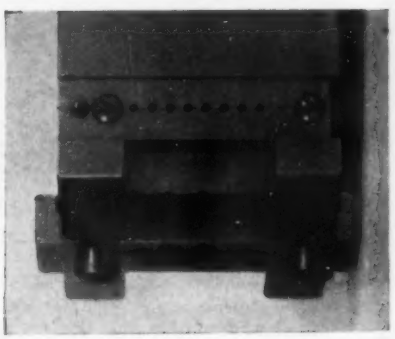
Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

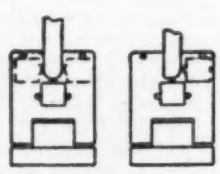
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to ⅜" can be held accurately in line with the vertical center line of spindle.

.013 Male and Female Radius

.500 Male and Female Radius



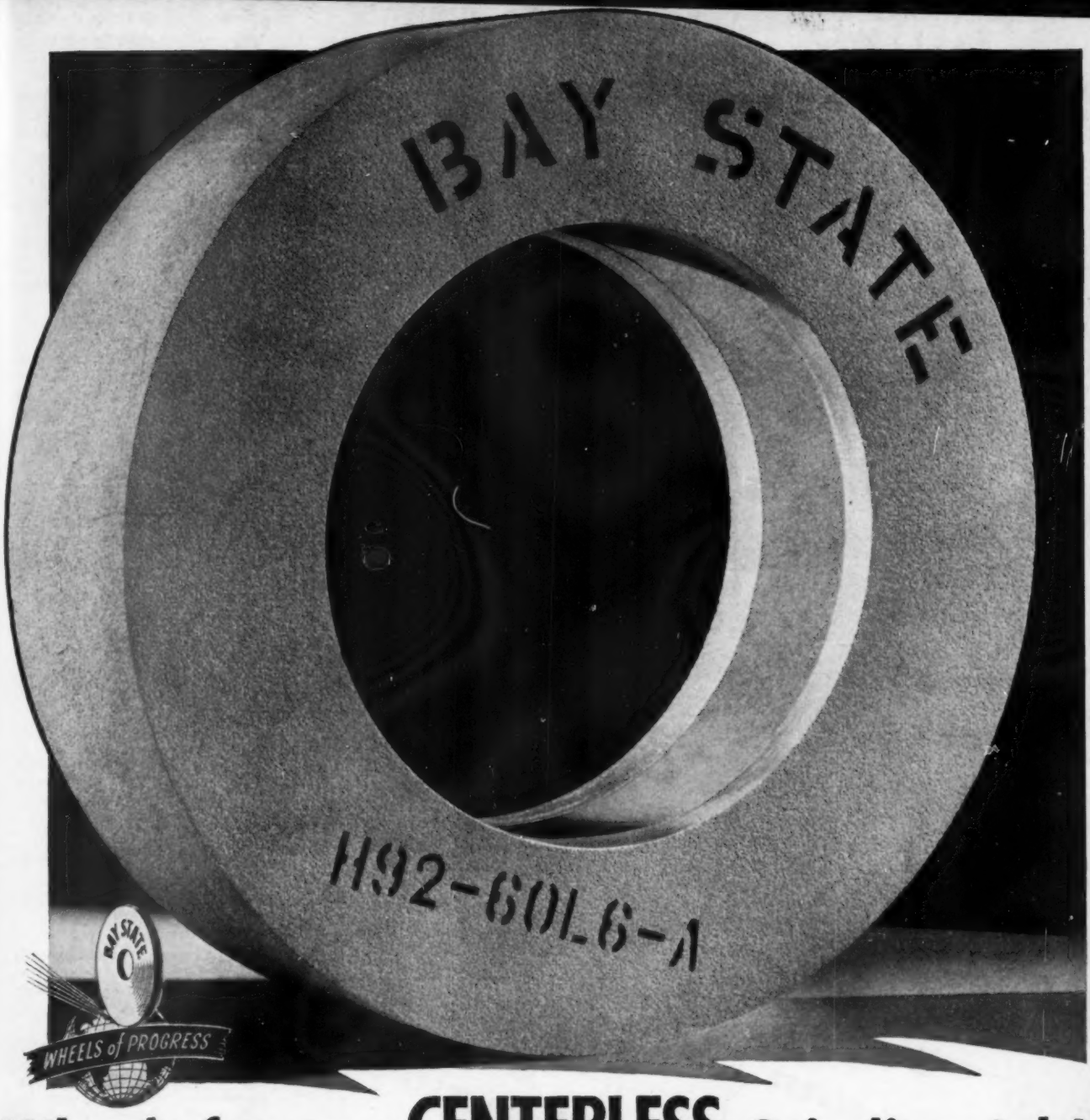
180° and 90° Male Dressing

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, ¼ K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.



Wheels for *any* CENTERLESS Grinding Job!

There are reasons for BAY STATE Superiority through Scientific Manufacturing Control.

1. FRACTIONAL GRADES — permit a wider range for a more accurate wheel selection.
2. CONTROLLED POROSITY — assures duplication.
3. H9 BOND — offers cooler cutting, greater wheel life, better production.
4. PATENTED INSTRUMENTS — for checking the hardness of grades. *Send for Bulletin.*

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

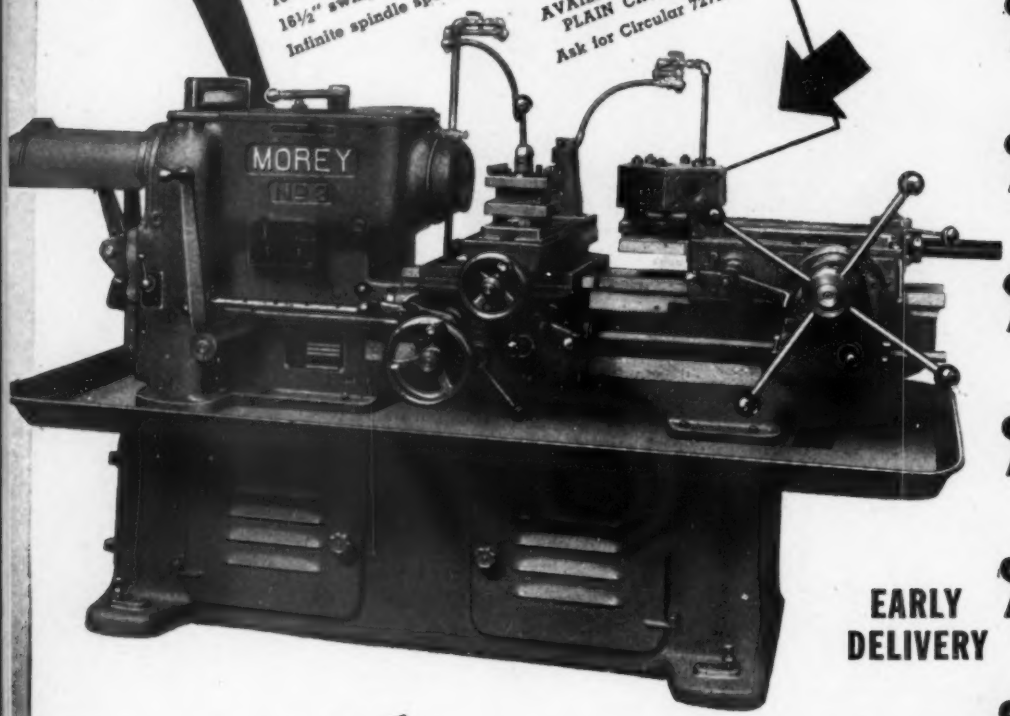
MOREY TURRET LATHES

for BAR *or* CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM

AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



EARLY DELIVERY

#2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.
- BED MOUNTED ON CABINET BASE.
- MOTORS AND STARTING EQUIPMENT EASILY ACCESSIBLE.
- HEXAGON TURRET AUTOMATICALLY UNCLAMPED, INDEXED AND CLAMPED.
- THREE TYPES OF CROSS SLIDES AVAILABLE:
  Lever Feed
  Screw Feed
  Combination Feed*
  *Combination feed provides instantaneous selection to either lever or screw feed.
- EIGHT (8) FEED CHANGES FOR THE UNIVERSAL CARRIAGE and HEXAGON TURRET, INSTANTLY ENGAGED OR DISENGAGED BY ONE MOVEMENT OF THE LEVER.

ARMY E NAVY

- THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY

MOREY MACHINERY CO., INC

410 BROOME STREET, NEW YORK, N. Y. *Plant* 4-57 26TH AVE., ASTORIA, NEW YORK

U SPEED PRODUCTION

IERE'S DOUBLE BARRELED ACTION!

WETMORE DESIGN FEATURES

o other reamers and boring bars have the combination of oduction-speed-up engineering features incorporated into etmore tools, such as: Rigid construction with patented ade lock and extra heavy blades, insures better finish with- t digging in or chatter . . . threads milled on centers, blade ats ground true with threads, and blades always bot- med, permits holding to close tolerances . . . blades may set out 7 to 50 times, depending on size . . . and heavier ts may be taken because of rugged construction, scientific inding and quality materials. Wetmore tools have been own for years among top-flight metal working plants as quality line, and Wetmore users represent practically a lue-book" of American industry.

TOCK DELIVERY Tool up now for higher war produc- n, and be ready also for the post-war accumulated demand consumer and other goods. Phone, wire or write.

IRE OR PHONE us for quotations and delivery dates, d for the Wetmore Tool Catalog if you don't already have it.

WE'VE STEPPED UP REAMER PRODUCTION

With new, single purpose high production machines installed in our plant, new expediting methods, and new planning schedules, we have been able to step up the manufacture of Wetmore Reamers and Boring Bars to the point where we can make stock delivery of standard types and sizes, and unusually good delivery on other items.

SO YOU CAN SPEED UP WAR PRODUCTION

The faster cutting and finer finishes you get on precision holes with Wetmore quality tools mean less machine time per piece . . . less manhours per piece . . . less spoilage . . . longer life of tools . . . less tool setting and maintenance . . . all of which add up to higher production and lower manufacturing costs.

EAMERS AND . . . . . BORING BARS

WETMORE REAMER COMPANY

418 N. 27th St., Dept. 00, Milwaukee, Wisconsin

NEW OPERATING MANUALS

are now ready to help you get maximum service from your

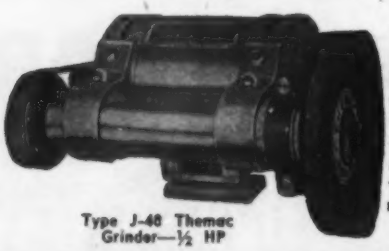
THEMAC PRECISION GRINDERS

As a THEMAC user, you will welcome these Manuals because they provide information of practical help in getting longer and better performance from your THEMAC GRINDERS. These Manuals are timely because it may be difficult to obtain new equipment and your immediate problem may be one of keeping present equipment in prime productive operating service.

In these new Manuals are included diagrammatic sketches of each type of grinder. Design and construction are shown in detail; all parts are numbered to facilitate identification for servicing and ordering. A pulley chart with available speeds and also giving size and number of belt required for various speeds is included — in fact all information for maintenance, repair and servicing to assure operation at maximum efficiency and performance.

THEMAC maintains a complete stock of THEMAC GRINDER replacement parts for prompt shipment.

AVAILABLE FOR THE FOLLOWING MODEL MACHINES



Type J-48 Themac Grinder—½ HP

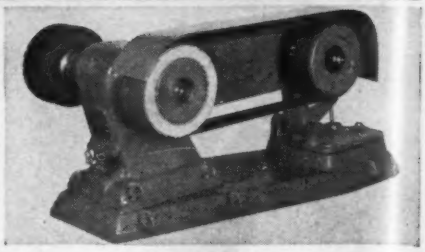
J-2A; J-3; J-30; J-4; J-40; J-7; J-15.

Be sure and furnish the serial numbers and types of your machines in sending for these Manuals in order that we can identify your requirements.

THE McGONEGAL MANUFACTURING CO.
East Rutherford N. J.

A PRODUCTION TOOL for Faster Grinding, Deburring, Finishing

JONES BENCH GRINDER and Polishing Machine NO. 135



This high production unit finds a wide range of uses on all types of grinding, deburring and finishing work—from flat pieces to irregular-shaped parts. Uses endless, fast-entry abrasive belts. Features precision ball-bearing construction, controls handy to operator. Segment Face Contact Wheel, and Jones 3/M Rubber Contact Roll.

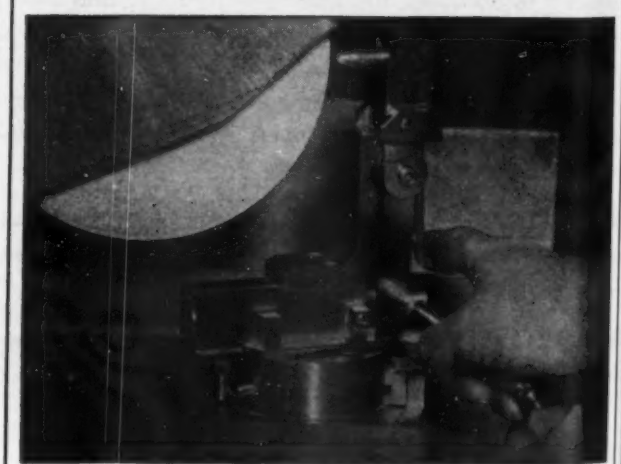
WIDE RANGE OF USES

Aircraft parts finishing and deburring . . . Metal parts and Plastic finishing . . . Weld grinding . . . Flat and irregular shape grinding and finishing . . . Flashing, grinding and finishing of small Forgings . . . Cutlery, Tools, Chisels, Drills, etc., grinding and finishing . . . and a host of other uses.

Speed your production with Jones Bench Grinders. Other types to suit your requirements. Write today for Bulletin No. 135.

JONES ENGINEERING COMPANY
DEPT. A-3, ELLWOOD CITY, PENNSYLVANIA

A RADII & ANGLE DRESSER
OF PRECISION AND VERSATILITY



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle	Two angles and radius.
Two angles	Many other diversified
Concave radii up to 6"	forms to meet require-
Convex radii up to 4½"	ments.

Wheel size capacity—9½" dia.; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY
J. & S. TOOL CO. 477 MAIN ST. EAST ORANGE N. J.
PRECISION DRESSING TOOLS

THIS TRIMMER SAW IS PUTTING WINGS ON "BOX CARS"

While Disston engineers are creating new tools with which to do old jobs better, the standard Disston tools are ever finding new ways of usefulness.

Because it leaves wood with remarkably smooth, square ends, this Disston saw is speeding the production of the newest wonders of war-spurred aviation—the huge 8-motored planes that have proved they can carry 120,000 pounds of *freight*.

Long renowned for running true and cutting straight, the Disston 4-S Smooth Trimmer Saw isn't a new tool. In helping mass production of the giant wooden, water-based flying box cars, it has simply found a new and thrilling job to do in the war effort.

Made of specially heat-treated Disston Steel, highly tempered and hollow ground for longer life between sharpenings, this efficient saw reflects the craftsmanship responsible for the extra quality of all types of Disston wood and metal cutting saws, files, hack saw blades, tool bits and machine knives. Cooperation on tool problems and information about Disston products are yours for writing Henry Disston & Sons, Inc., 920 Tacony, Philadelphia 35, Pa., U. S. A.

DISSTON

Conserve Man-Minutes and help win the war

The SHIELDS No. 3 Vertical Universal MILLER

. . . handles difficult jobs accurately at one set-up

This versatile machine is particularly adaptable to milling, boring and drilling on such difficult jobs as those involved in airplane, tank and die work where machining of several surfaces at one set-up is essential to insure accuracy.

The following features of this machine which contribute to its fast accurate and convenient performance include.

. . . Universal milling with dividing head and centers made possible by ability to throw head over at any desired compound angle without swinging table at cutting angle for clearance of cutter in spiral being cut.

. . . power feeds down to spindle are incorporated in head with sliding gear transmission, making possible drilling and boring at compound angles in parts and on different faces without changing set-up.

. . . spindle has 7" travel and variable speeds from 35 to 1128 R.P.M., assuring versatility for handling a wide variety of work.

. . . face mills up to 8" diameter can be used and heavy cuts taken.

Investigate these and other valuable features offered in this machine as a means of handling difficult jobs accurately without the need for costly fixtures.

DELIVERY 4 WEEKS

CONDENSED SPECIFICATIONS

Table Working Surface—64" x 16"
Longitudinal Power Travel—34"
Cross Power Travel—14"
Vertical Power Travel—17½"
Spindle—No. 40 National Standard Taper Hole
Table Feeds—½" to 16"
Spindle Speeds—10
Spindle Power Feeds—4

Shields Mfg. Co., Inc., Long Island City, N. Y.

SELECT THE RIGHT WHEEL

AND SAVINGS WILL FOLLOW

Vitrified makes it possible to standardize on grinding wheels by offering a wide range of standard types which cover practically all wheels used on standard makes of grinding machines.

Selection of the right wheel for the work to be handled is simplified in the Vitrified catalog—a 65-page booklet which gives specific data, dimensions, etc., covering the entire Vitrified line.

Send for this catalog. Choose a grinding operation in your shop on which you would like to cut costs. Select the Vitrified wheel which meets your specifications, try it out, and compare results with the method formerly used—and you, too, will join the long list of progressive manufacturers which have standardized on Vitrified.

Write for the catalog today

VITRIFIED

VITRIFIED WHEEL COMPANY
WESTFIELD **MASS.**

Meehanite Foundries

Allentown, Pa.
Traylor Engineering Company

Ansonia, Conn.
Farrel-Birmingham Co., Inc.

Birmingham, Ala.
Continental Gin Company

Bridgewater, Mass.
The Henry Perkins Co.

Brooklyn, New York
E. W. Bliss Company

Buffalo, N. Y.
Pohlman Foundry Co., Inc.

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Kanawha Manufacturing Co.

Chattanooga, Tenn
Ross-Meehan Foundries

Chicago, Ill.
Greenlee Foundry Company

Cincinnati, Ohio
Cincinnati Grinders Incorporated
The Cincinnati Milling Machine Co.

Cleveland, Ohio
Fulton Foundry & Machine Co.

Denver, Colo.
The Stearns-Roger Mfg. Co.

Detroit, Mich.
Atlas Foundry Co.

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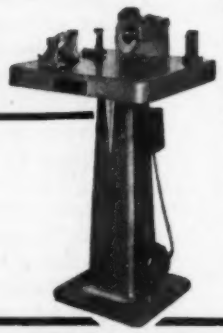

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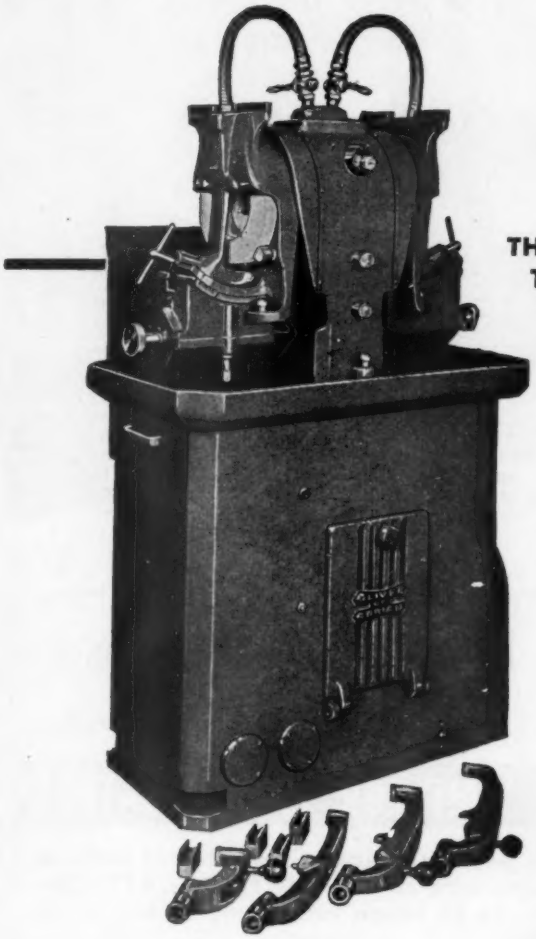

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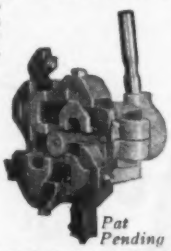

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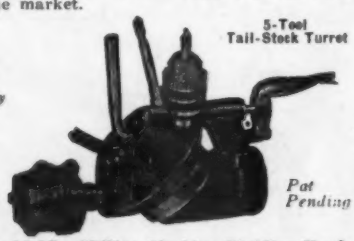

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M-3

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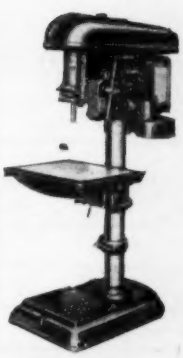

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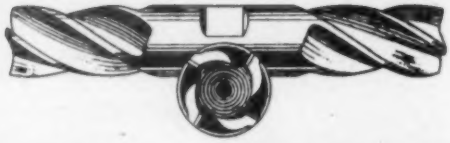

REMINDERS

Diameter of End Mill	Tool Steel 70 ft. per Min. R. P. M.	Machine Steel 80 ft. per Min. R. P. M.	Cast Iron 90 ft. per Min. R. P. M.
1/16"	4276	4888	5498
3/32"	2855	3259	3688
1/8"	2140	2440	2750
3/16"	1420	1625	1830
1/4"	1070	1222	1375
5/16"	856	978	1100
3/8"	713	815	917
7/16"	611	698	786
1/2"	535	611	688
9/16"	475	543	611
5/8"	428	489	550
11/16"	389	444	500
3/4"	357	407	458
13/16"	332	379	427
7/8"	306	349	393
15/16"	285	326	366
1"	267	306	344
1-1/8"	238	272	306
1-1/4"	214	244	275
1-3/8"	194	222	250
1-1/2"	178	204	229
1-5/8"	165	188	212
1-3/4"	153	175	196
1-7/8"	143	163	184
2"	134	153	172

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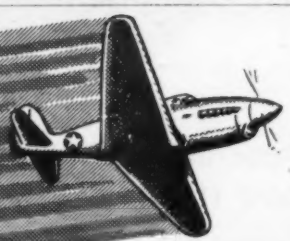

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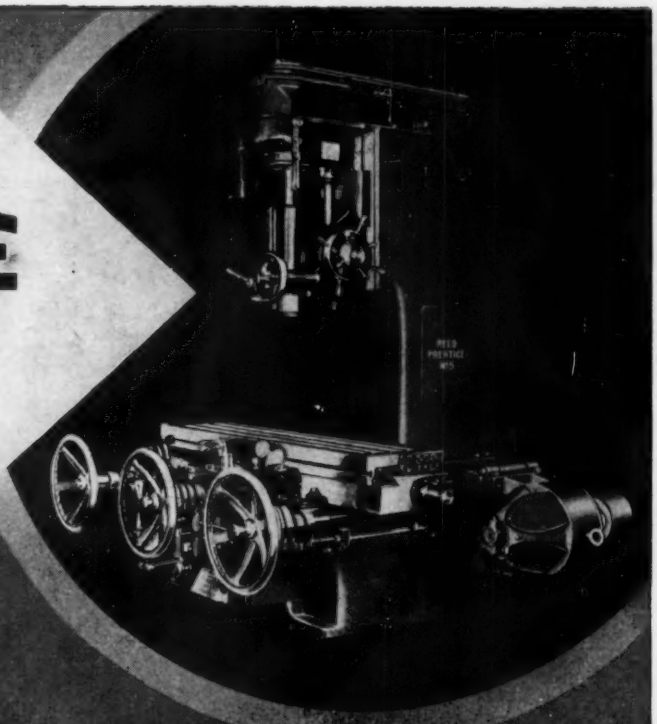

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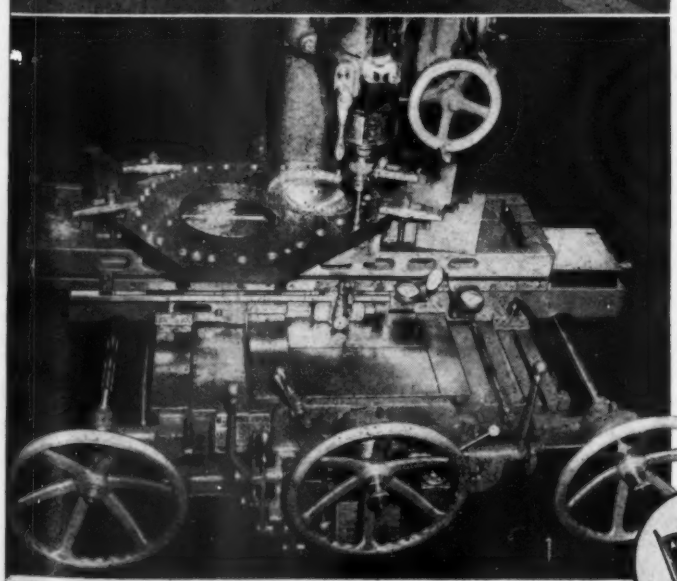

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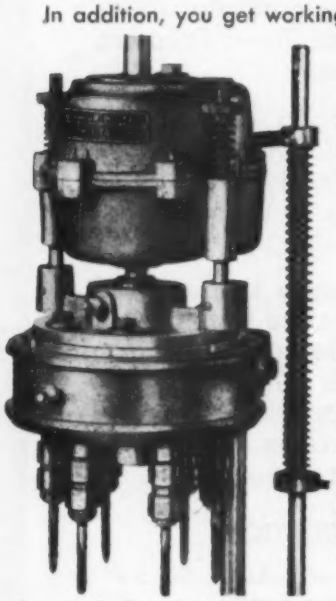
MULTIPLE SPINDLE HEAD

It takes only one Ettco-Emrick Multiple Spindle Head to give you **maximum production of drilled or tapped holes** on parts which call for these operations. And here's why:

When you order an Ettco-Emrick Multiple Spindle Head for drilling or tapping a specific part, you get much more than a piece of equipment. You get a Head that has been engineered to carry through the **method of handling** the specific part that provides for drilling or tapping **all of the required holes simultaneously** in one part or in a number of the parts.

In addition, you get working drawings of the **holding fixture** in which the specific part can be **quickly and accurately set up** and **progressively fed** for the drilling or tapping operations.

With this combination you are assured of maximum production.



A typical Ettco-Emrick Multiple Tapping Head for tapping 6 holes simultaneously. A Quill Clamp is supplied to assure the rigidity needed for high precision work. The same gear case assembly can be used for drilling the holes.

RANGE OF THE MULTIPLE HEADS

Ettco-Emrick Multiple Spindle Heads cover the drilling of holes from wire sizes to 1/2" inclusive and the tapping of holes from machine screw sizes up to 5/16" inclusive — in every case with the Ettco-Emrick central driving and automatic reversing mechanism. Heads can be used on any drill press or tapping machine.

DETAILS OF THE MULTIPLE HEADS

Full details are given in BULLETIN No. 3. A copy will be mailed on request. Write for yours today.

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn 6, N. Y.

Detroit • Chicago

The famous Ettco-Emrick **DRILL CHUCKS • TAP HOLDING CHUCKS**
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

HIGH PRODUCTION OF UNIVERSAL DRILL BUSHINGS HELPS SPEED UP AMERICA'S WAR WORK . . .

From coast to coast America's war plants are speeding their war work with Universal Drill Bushings. They are straight and round, have superfinished bores to insure accuracy and unexcelled wearing qualities. It pays to use Universal Drill Bushings. Write for catalog.

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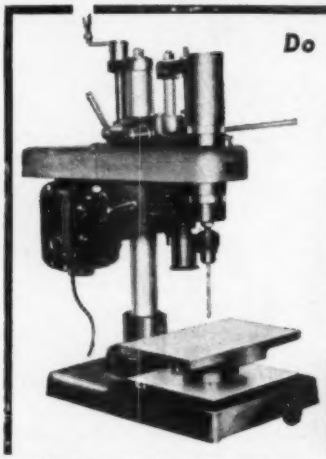


Do your sensitive drilling on a

MAXI-JR-E

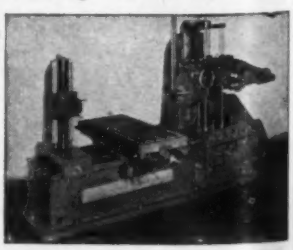
● Here is a high production unit for small holes from .004" to .250" diameter. Sturdy — smooth — fast —it is a self contained unit with 8 inch vertical adjustment on column. Drilling unit overhang from center of chuck to column 5". Vertical capacity 10". Available in spindle speeds from 750 to 12,000 r.p.m. Write for bulletin.

The Hamilton Tool Co.
HAMILTON OHIO

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



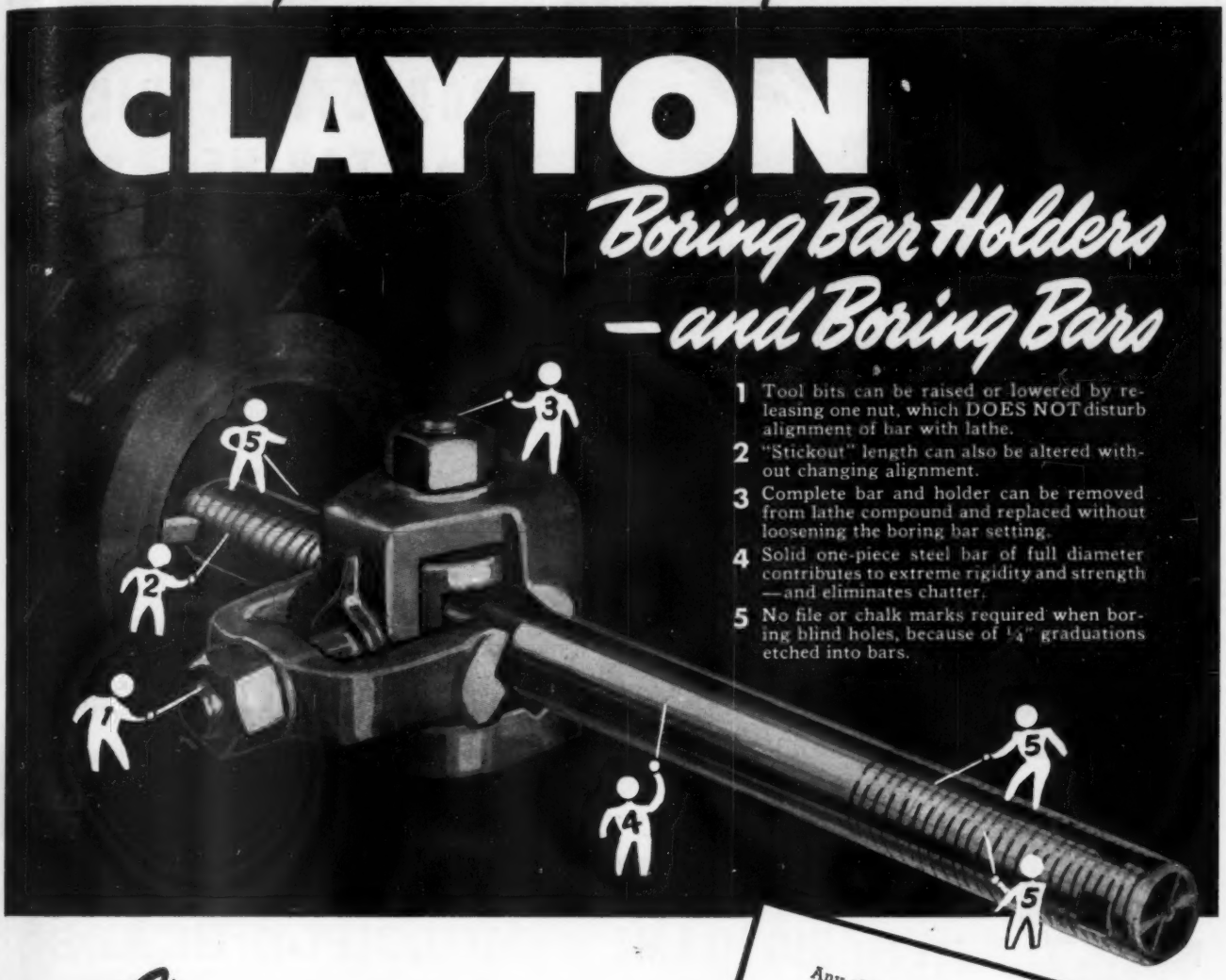
Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

New Design Saves Time and Speeds Production

CLAYTON

Boring Bar Holders —and Boring Bars



1 Tool bits can be raised or lowered by releasing one nut, which DOES NOT disturb alignment of bar with lathe.

2 "Stickout" length can also be altered without changing alignment.

3 Complete bar and holder can be removed from lathe compound and replaced without loosening the boring bar setting.

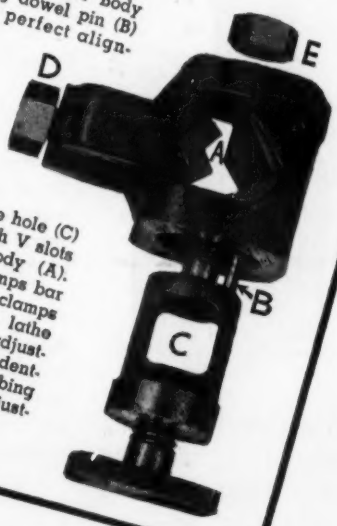
4 Solid one-piece steel bar of full diameter contributes to extreme rigidity and strength —and eliminates chatter.

5 No file or chalk marks required when boring blind holes, because of 1/4" graduations etched into bars.

Clayton Boring Bar Holders are quickly paid for in reduced set-up time. They are more rigid, permit deeper cuts, speed shop production. Available for lathes from 6″ to 48″.

PROMPT DELIVERIES ASSURED
Order from your local supplier or direct from factory

Any size Boring Bar (within capacity of Holder) fits through Bar Holder Body (A). Sliding dowel pin (B) maintains perfect alignment of clearance hole (C) in center post with V slots in Bar Holder body (A). Nut (D) rigidly clamps bar in holder. Nut (E) clamps body assembly to lathe compound. Either adjustment is made independently and without disturbing the alignment or adjustment of the other.



ARMY (E) NAVY

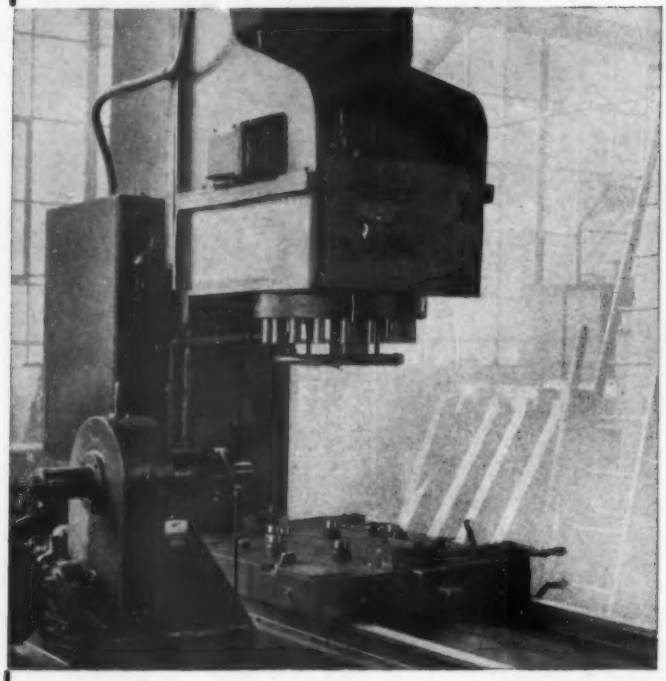
CLAYTON MANUFACTURING COMPANY

ALHAMBRA, CALIFORNIA

Buhr

MULTIPLE SPINDLE PRODUCTION DRILL and TAP HEADS

convert any machine for quick changeover



17-SPINDLE BUHR TAPPING HEAD

Mounted on a vertical column and direct driven by motor. Circulating oil pump for positive lubrication and vertical adjustment in spindles for tap adjustment. Buhr single Spindle Horizontal Tapper mounted on a bracket and driven direct by motor.

BUHR MACHINE TOOL CO.

GREEN and DAVIS

ANN ARBOR MICHIGAN

Specialists in Multiple Spindle Drilling, Boring, Reaming, and Tapping Equipment

VERTICAL JIG BORING, MILLING, DRILLING AND REAMING with 8 speeds and micrometer setting

Save YOUR "HEAVIES" FOR THE BIG GAME

It's more productive to let the fast little fellow carry the ball some of the time than to wear out the "big heavy" in all plays . . . both football and industry.

The Linley high speed Jig Boring and Milling machine is a case in point. It saves power, wear and time by taking on a great variety of rush jobs in machine shop and tool room, freeing larger machines for work better suited to their higher capacities.

"A speed for every need"—8 of them, 275 to 4250 r.p.m. and the versatility for quick changeover, simplify operations in precision die work, jig, metal pattern and model making, with maximum tool protection and low cost.

There's a place for one or more Linleys in your shop. Write for instructive bulletin.

LINLEY BROTHERS CO.

664 STATE ST. EXTENSION
BRIDGEPORT, CONN.

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STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

GEOMETRIC Pointers FOR SAVING HIGH SPEED STEEL

No. 9

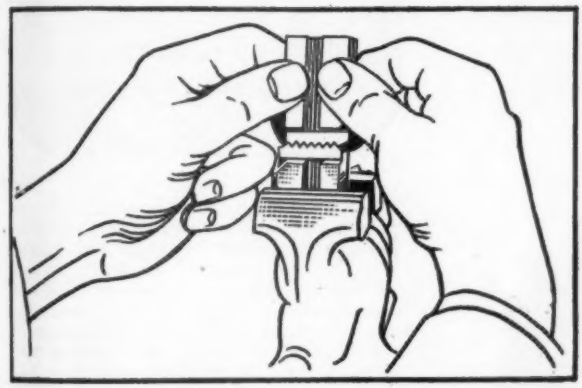
WHY CHASERS SHAVE —AND THE REMEDY

One of the most common causes of poor thread form is "shaving"—meaning that one or more of the chasers in the set are not tracking or following exactly in the groove cut by the preceding chaser or chasers, and are consequently shaving off the side walls of the thread. The resultant thread is thin and of poor form. Some of the causes of shaving:

1. **Worn die head.**
2. **Misalignment of machine or die head.**
3. **Inexperienced operation—forcing chaser ahead too fast or allowing turret or spindle to drag.**
4. **Chasers improperly ground for material being threaded.**
5. **Chamfers of chasers or cutting face ground free-hand or with lack of uniformity.**

Obviously, if the die head or the machine is in bad condition, repair or replacement is necessary before correct threads can be cut. If the error is due to faulty operating conditions or poor grinding, these must first be eliminated —then the chasers themselves must be lined up again by a lapping operation. (See suggestions at left.)

Securing the maximum number and best quality of threads out of every chaser reduces "machine down time," increases production, lowers cost per piece threaded—and helps save much-needed high speed steel! The Geometric Tool Company, New Haven 15, Connecticut.



HOW TO LAP CHASERS THAT SHAVE

This method applies to milled chasers only. The object is to slightly dull the cutting edges of the offending teeth so that the chaser will be forced into line with the others of the set.

1. Identify the offending chaser or chasers by looking for frosting (bright narrow band) on cutting face along front or back edges of teeth.

2. Grip a good chaser in a vise with threads of chaser up, hold imperfect chaser between fingers and start lapping. Use fine emery or carborundum. Upper chaser should be forced sidewise or twisted slightly so as to lap sides of teeth that show frosting. It should be tipped slightly so that lapping will not be carried across full width of land but only along cutting edge.

3. Remove frosting from cutting face of chasers with oil stone before further testing of chasers. If frosting again appears, lapping must be continued. Amount of lapping depends upon how badly the chasers have been shaving.

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies whose employes contribute at least 10 per cent of their earnings, through the Payroll Savings Plan, for War Bonds. Buy War Bonds and Stamps each payday. Shortening the war means saving lives!

ARMY E NAVY

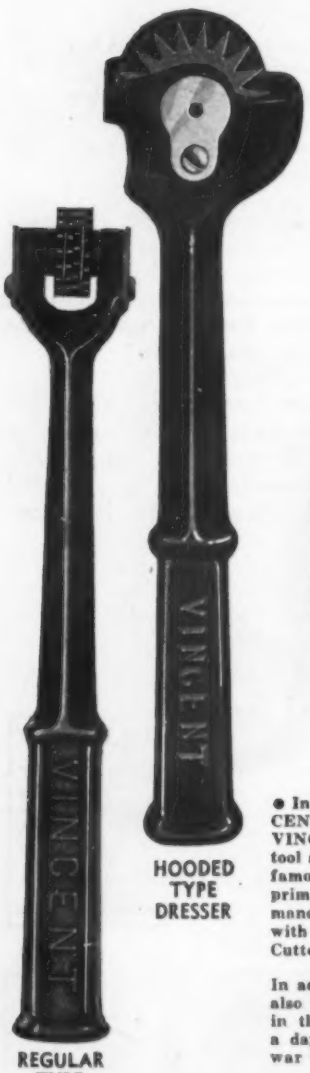
GEOMETRIC

SELF-OPENING DIE HEADS
COLLAPSING TAPS
CHASER GRINDING MACHINES
SOLID ADJUSTABLE DIE HEADS
SOLID ADJUSTABLE TAPS
THREADING MACHINES

MEMO

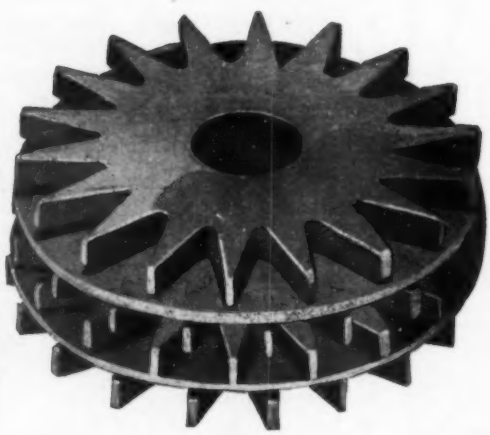
How to get Increased Production from Grinding Wheels

- Dress grinding wheels regularly to remove impregnated metals.
- True them regularly to square off face and remove nicks.
- Use equipment that will do the job properly . . . VINCENT-HUNTINGTON Grinding Wheel Dressers and Cutters.



HOODED TYPE DRESSER

REGULAR TYPE DRESSER



● Increase your war production grinding efficiency with VINCENT-HUNTINGTON Grinding Wheel Dressers and Cutters. VINCENT-HUNTINGTON Cutters are made of high-carbon tool steel . . . teeth are milled—and they are heat-treated by the famous "Vincent Process" to a specific hardness. Hundreds of prime and sub-contractors are meeting difficult production demands and keeping grinding wheels cutting at top efficiency with VINCENT-HUNTINGTON Grinding Wheel Dressers and Cutters.

In addition to making Grinding Wheel Dressers and Cutters, we also operate two of the largest production heat-treating plants in the United States. These two plants are working 24 hours a day, 7 days a week, and turn out approximately 300 tons of war work daily.

Write today for our catalog sheet which shows all the tools with standard sizes and dimensions.

"If it's a Huntington Dresser or Cutter Vincent Makes It"

THE VINCENT STEEL PROCESS CO. BELLEVUE AT VERNOR DETROIT 7, MICHIGAN

KNOW YOUR MATERIALS AND HOW TO WORK THEM

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. . . send for these reprints of practical production data.

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1 Working of Aluminum Alloys
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5 Working of National Emergency Steels
6 Alternate Steels for Emergency Use
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● Here, in compact, easy-to-use form, are digests of authoritative Metal-Working practice followed in war-busy plants. Each reprint appeared originally as one of the well-known *American Machinist* "blue sections." Each details characteristics of a particular material or group of materials . . . tells what they are and how to work them. Production executives find these compilations useful in employee training.

Check over the list above . . . if you want any reprints order them now while our limited supply lasts. Coupon below for your convenience.

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AMERICAN MACHINIST
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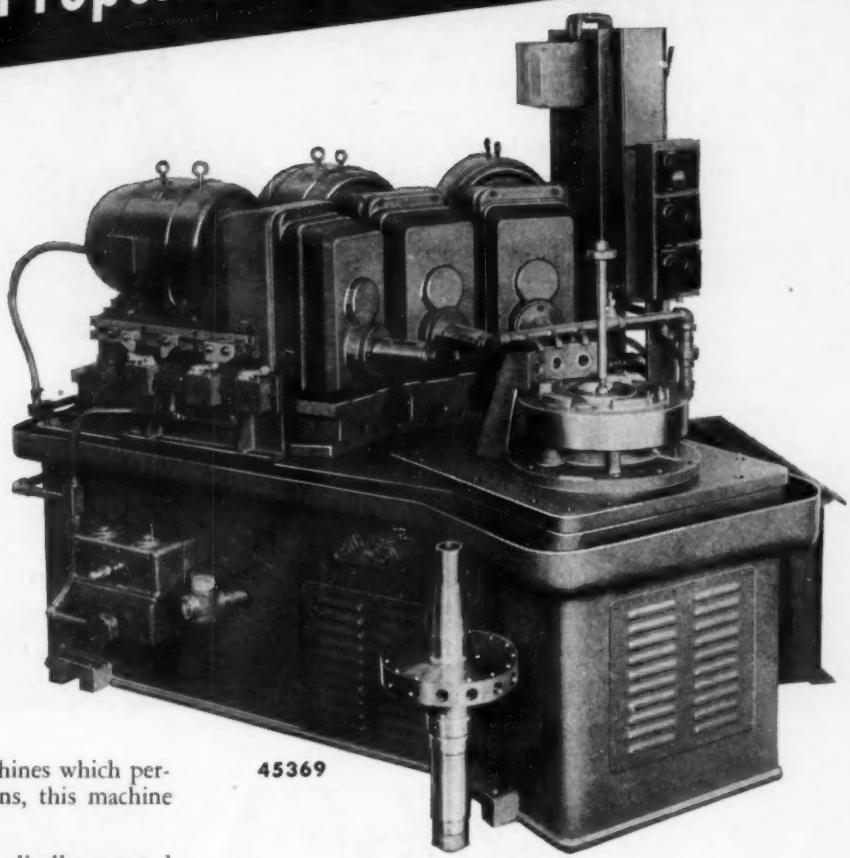
Snyder Machine Triples Production on Aircraft Propeller Shaft Operation



45369

COMPARED to many Snyder machines which perform complex and difficult operations, this machine is relatively simple.

It is a horizontal, three-way, hydraulically-operated drilling machine, designed to drill 15 holes, equally spaced around an extended pan on a forged aircraft propeller shaft.

Each of the three drill heads has an individual hydraulic feed cylinder and all three are geared for single electrical control.

The index mechanism is electrically synchronized and the operation is continuous and automatic until the 15 holes are completed in five indexes, after which the machine stops for unloading and reloading. Rapid advance and return of slides is provided to make tool exchange easy.

The saving in time over drilling single holes by hand on a standard machine is obvious, production on this machine being three times that possible by conventional methods.

The hydraulic equipment is housed in the welded steel base. Coolant is contained in a separate tank and trough at the side of the machine.

Although this is one of the simpler machines designed and built by Snyder, it demonstrates the important savings in time and cost possible through the use of the automatic cycle machine, hydraulically operated and electrically controlled.

In such machines, rate of output, precision, finish and safety are not left to the skill or discretion of the operator — they are built into the machine and its efficiency is automatic.

Your post-war success may be profoundly influenced by the use of such machines. Snyder engineers are ready to consult with you on far-sighted production plans.

SNYDER
TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit 7

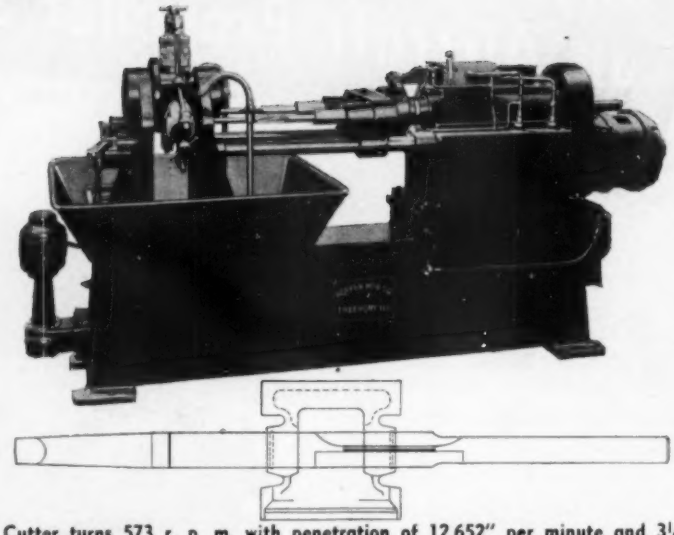
designers and builders of machinery for HIGH *production at* LOW *unit cost*

PILOTED CUTTING TOOLS BORE AND REAM DIE CASTINGS

★ This single end Hoefer Machine has a 5 h. p. unit on which is mounted 2 spindle heads tied to a 3-station index fixture by guide bars. It bores and reams cored pin holes in die cast pistons. Tools are piloted both front and rear.

Machine is equipped with coolant pump all controlled from central electrical control. Hydraulic feed of unit is automatically started when index plunger fully enters the index bushing on trunnion.

Hoefer Hydraulic Feed Units plus Hoefer Multiple Spindle Heads offer an economical solution to production drilling problems. Investigate the advantages of this equipment as concerns your present and post war production.



Cutter turns 573 r. p. m. with penetration of 12,652" per minute and 3½" total travel. Time required is 15½ seconds if feed moves full length at .024" per revolution. Requires only 9 seconds if reamer travels through the two ⅞" bosses and jumps center gap of 1¾". This can be done with an adjustable jump mechanism furnished as an extra.

Hoefer's Whole Business is Holes . . . **HOEFER MFG. CO.** *Freeport, Ill.*

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IN ONE OPERATION

The simultaneous performance of two or more operations such as combining knurling and marking is only one way in which Noblewest marking equipment speeds production, cuts costs. Noblewest equipment is saving time and money every day in marking hundreds of different products with precision and speed that only long experience and careful engineering could produce. Model 73 (illustrated) is tooled for marking and knurling vulcanized fibre handles. Write today for full information.

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MARK IT BEST WITH NOBLEWEST®

UNIVERSAL MIKRO-LOK PRECISION BORING BARS

Tooling is now going forward to get on a production basis so that orders for the new Universal Mikrolok Precision Boring Bars can be filled more promptly.

Universal Mikrolok Boring Bars can be adjusted as quickly and easily as a micrometer to limits of .0005 or less. Mikrolok cutting tools are extremely rigid, are available with taper shanks for Swiss Jig Boring Machines and with Morse shanks, straight shanks and a variety of flanges for Diamond Boring machines. Write for catalog.

UNIVERSAL ENGINEERING CO.

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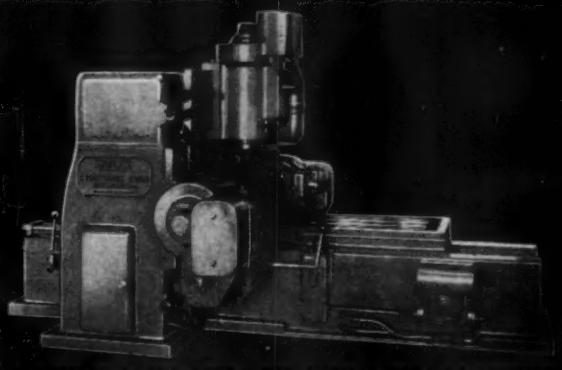
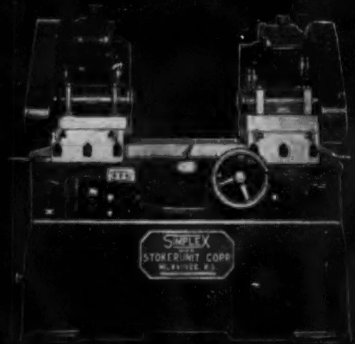


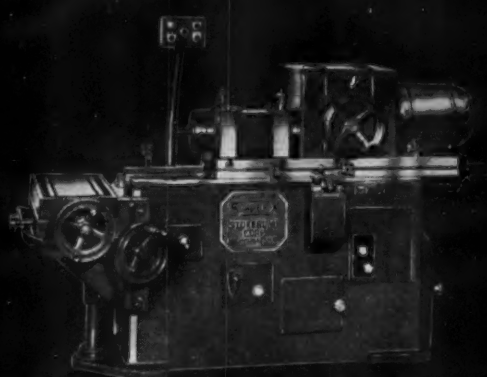
SIMPLEX PLANER-TYPE PRECISION MILLING MACHINES. For high production milling of duplicate parts, or for general-purpose face milling of similar parts. Available with 1, 2, 3 or 4 heads for simultaneous milling of several surfaces. (3-head machine shown.)

SIMPLEX PRECISION BORING MACHINE No. 1. Provides maximum economy and accuracy in boring small parts such as precision bearings, actuating cylinders, etc. With 1 or 2 spindles. (2-spindle machine shown.)

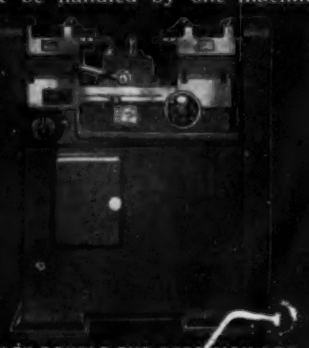
SIMPLEX UNIT-TYPE PRECISION BORING MACHINES. New flexibility provides wider application than conventional machines. Shown is No. 2U 3-Way Machine with 3 No. 3 spindles, arranged for boring differential housings, air and electric tool parts, governor housings, etc.



SIMPLEX PRECISION BORING MACHINE, SERIES 200, 4 spindles. Especially designed for shops where a large number of production jobs of varying types must be handled by one machine.



SIMPLEX KNEE-TYPE PRECISION BORING MACHINES. Model No. 3U, illustrated above, is equipped with No. 3 spindle, variable speed spindle drive, turret stop for table. Designed for accurate, precision boring, particularly where one machine must be used for a variety of jobs.



SIMPLEX DOUBLE-END PRECISION BORING MACHINE No. 1. Arranged for double-end operation in boring automobile steering spindles, etc. Work fixtures are mounted in the middle.

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Super Sensitive

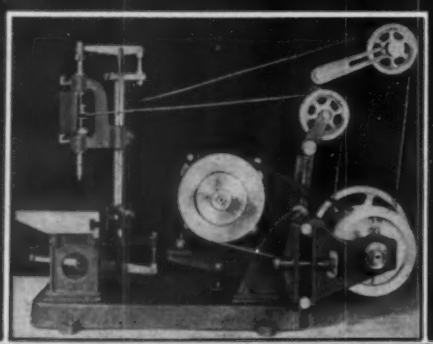
DRILL PRESS

— UP TO 23,000 R. P. M.

The Lord and Davis Super Sensitive Drill Press is designed for drilling holes from .004" to 1/16" in diameter. Proper cutting speeds are obtained by running the spindle at any of eight standard speeds from 3,000 to 23,000 R.P.M.

Finger-tip control, plus precision, balanced construction, allows heavy feeds and extreme accuracy with a minimum of drill breakage.

Machines are available with one, two, three or four spindles. Write for folder.



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BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

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The Original Manufacturers of Drill Chucks

The Almond Three-Jaw Drill Chucks were the first to be placed on the market. They were Pioneers in the field of Drill Chucks. For over seventy years Almond Chucks have formed a necessary part in the logical procedure of machine developments. Are made in types and sizes to fit all machine tools and portable drills.

Write for further information

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ASHBURNHAM, MASS., U. S. A.

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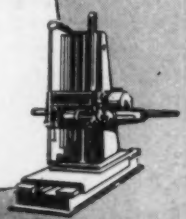
PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



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CINCINNATI, OHIO

Avey Sensitive DRILLING MACHINES

CINCINNATI OHIO

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HONERS . . . DRILLERS

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CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

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A TOWER OF STRENGTH

ON YOUR HORIZONTAL BORING, DRILLING AND MILLING OPERATIONS

GRAY

BORING MILL FLOOR TYPE

- 5½" diameter of boring bar
- 24 spindle speeds from 3 to 460
- Bar travel — 48" (standard) but can be increased to 72"
- Column travel — 6' (standard) but can be increased to 20'
- Vertical travel of head on column — 72" (standard) but can be increased to 96"
- Can be furnished with 18" or 24" cross traverse of column
- Weight of standard machine, without floor plate, 51,000#

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for descriptive circular.

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Cincinnati Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

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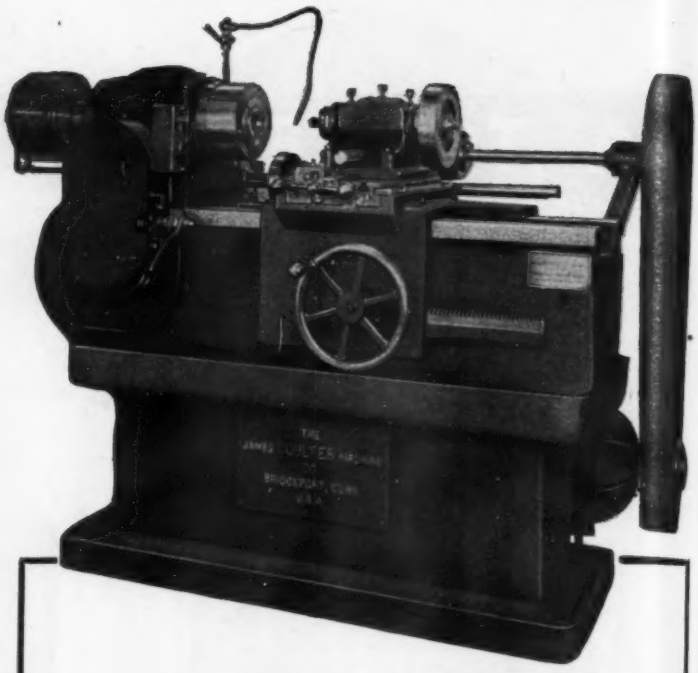
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.

These Are ACTUAL UNRETOUCHED Photographs
TURRET HOLDER TYPE
353—Straight Sleeves with Morse Taper Holes
TANG END TYPE
350—Morse Taper Sleeves with Morse Taper Holes
351—B. & S. Taper Sleeves with B. & S. Holes
356—Morse Taper Sleeves with B. & S. Taper Holes
358—B. & S. Taper Sleeves with Morse Taper Holes
TAPPED END FOR DRAW BAR
352—B. & S. Taper Sleeves with B. & S. Taper Holes
359—B. & S. Taper Sleeves with Morse Taper Holes
EXTENSION TYPE
354—Morse Taper Extension Sleeves with Morse Taper Holes

10 to 20 TIMES LONGER LIFE

After 2 months Equal Service in identical machines—Which of these 2 SLEEVES would YOU depend on for ACCURACY?

ON THE LEFT is illustrated an ordinary soft steel sleeve; on the right a Midwest Hardened and Ground Sleeve. Because Midwest Sleeves are scientifically hardened and precision ground, their length of accurate life is ten to twenty times longer than ordinary soft steel sleeves.

Furthermore, the longer life of Midwest Sleeves saves vital steels—steels otherwise consumed by repeatedly replacing soft sleeves which quickly become worn, marred and discarded.

MIDWEST

Engineers and Manufacturers of Precision Metal Cutting Tools which contribute to the progress, prosperity and comfort of mankind.

MILLING CUTTERS • SLEEVES • COUNTER BORES • END MILLS • REAMERS
SPECIAL TOOLS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

MIDWEST TOOL & MFG. CO., 2358 W. JEFFERSON AVE., DETROIT, MICH.

MILLHOLLAND

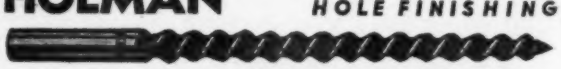
Automatic **DRILLING - BORING MILLING - TAPPING** Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

HOLMAN
BETTER, FASTER HOLE FINISHING



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

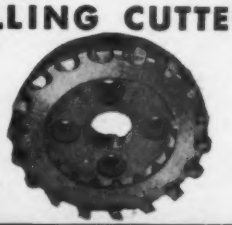
HOLMAN REAMER CO.
MANCHESTER, CONN.

Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

Cut

FASTER SMOOTHER EASIER

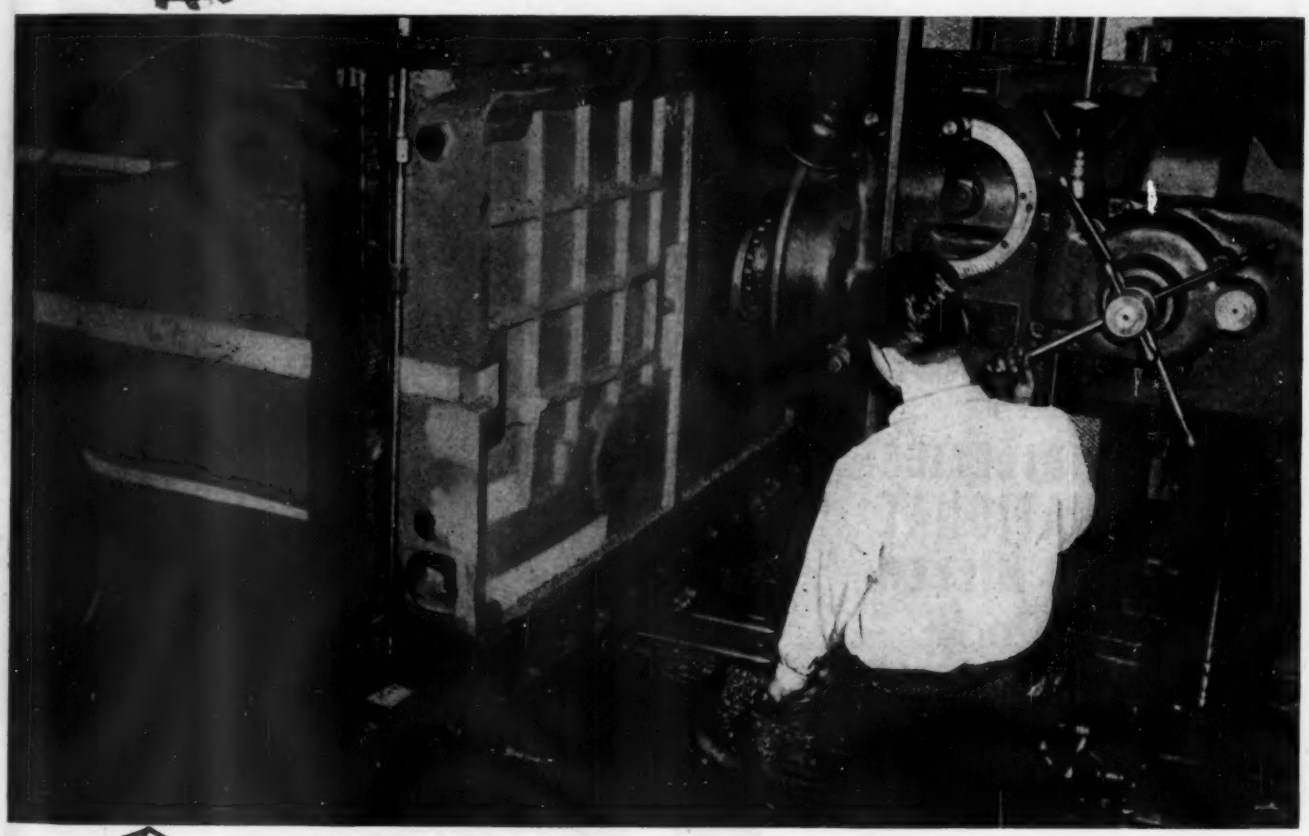
WITH LOVEJOY MILLING CUTTERS



LOVEJOY Milling Cutters have *positive-locking* inserted blades which cut faster, smoother and easier. There are definite reasons for this—the blades are held in the husky forged body so that they are immovable under the heaviest cuts and coarsest feeds—blades are removed, replaced and sharpened easily and quickly—over 50% of every blade can be used—free cutting qualities assure accuracy even when extreme overhang of the spindle is necessary—minimum power is consumed.

Lovejoy cutters enhance the accuracy and production of any milling equipment.

A trial will show the difference—in the meantime, write for catalog No. 26 for full information on standard cutters and blades.



A chance to be patriotic and also take advantage of Lovejoy positive-locking blades—use 50%, or more, of each blade, then sell it to your scrap dealer—High Speed Steel is scarce; use it wisely!

LOVEJOY TOOL CO., INC.

Springfield, Vermont, U.S.A.

GREATER SPEED, ACCURACY *and* HOLDING POWER *are assured by the* "HARTFORD" *Quick-Acting* MILLING VISE

Developed especially for milling of small arms, the "HARTFORD" can be depended on to speed production and maintain precision. It provides tremendous gripping power without any danger of spoiling work.

The lower cam-faced handle gives quick opening and return, while the top eccentric handle exerts tremendous binding force. Release of eccentric binding lever and a quarter turn of cam-lever opens movable jaw approximately ⅞"—a convenient feature providing easy chip clearance when working on thin pieces.

It also permits instant release of work when using false jaws and locating dowel-pins.

Movable jaw occupies position ordinarily occupied by fixed jaw and is a single, heat treated steel forging, ground on all fitting surfaces and assuring certain alignment. Single pieces can be held at either end of jaw without distorting jaws.

Screw holes interchangeable with those of No. 2B & S Vise. Slots for ⅝" keys are provided in base. All parts interchangeable with replacement parts from stock.

SPECIFICATIONS

Width of Jaw—5"
Depth of Jaw—1 3/16"

Maximum opening (Plain Jaw Type)

Jaws in place—2⅝"
Jaws removed—3½"

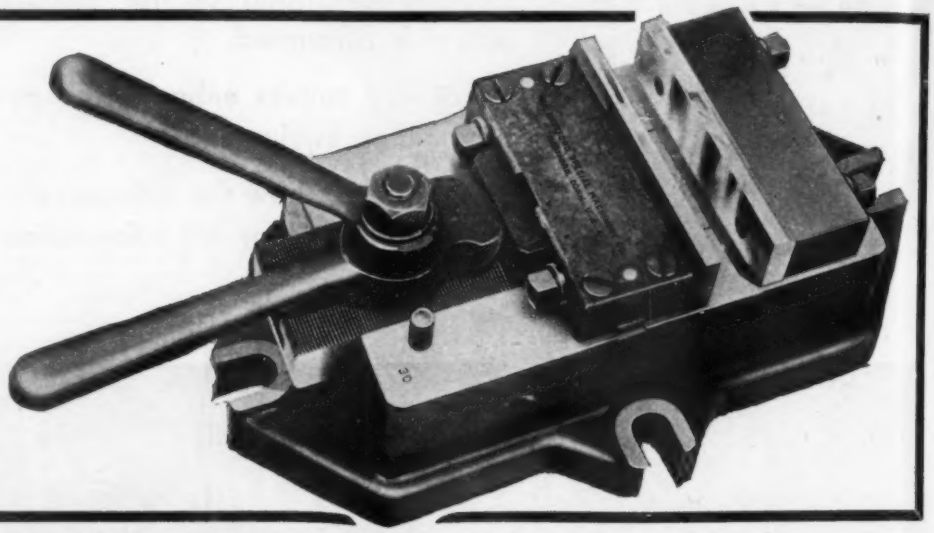
Maximum opening (Swivel Jaw Type)

Jaws in place—2¼"

Weight—40 lbs. Length overall—13". Width overall—8". Height overall—5". Center distance, between Jaw Screw Holes—3.258". Distance bottom of jaw to center of jaw screw holes—7/16".

AVAILABLE IN PLAIN AND SWIVEL JAW TYPES

Investigate TODAY:



The HARTFORD SPECIAL MACHINERY CO., *Hartford, Connecticut*

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

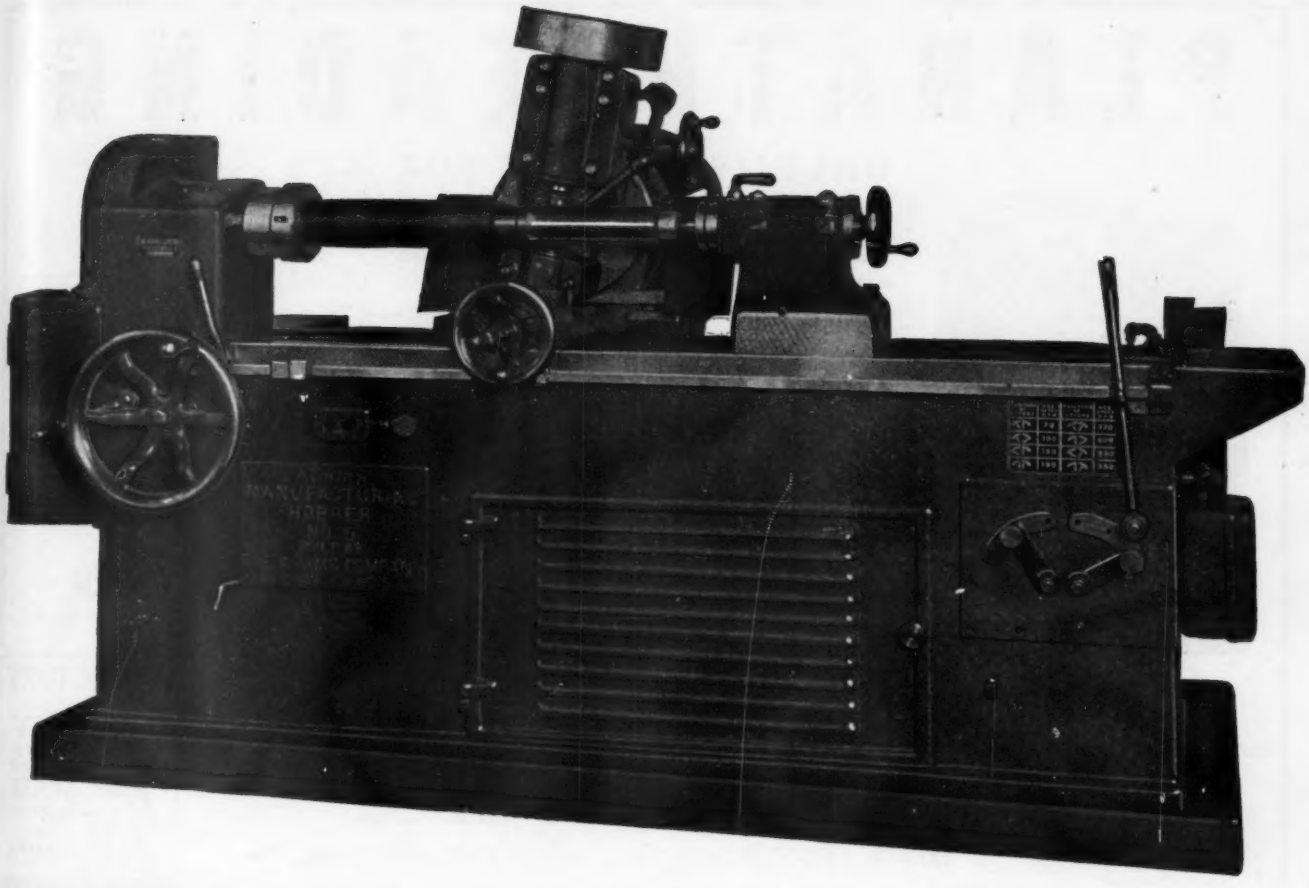
The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

W. H. NICHOLS & SONS
WALTHAM MASS.
Sole Distributor
NICHOLS-MORRIS CORPORATION
50 CHURCH ST. NEW YORK, N. Y.



SPLINING

on the

Adams Manufacturing Hobber

The production of multiple splined shafts within close tolerances is no problem when you use the Adams Manufacturing Hobber.

This is a machine that was designed specifically for multiple splines and spur gears and which is equally effective on short runs and production lots.

Simple setups, accessibility of work and controls, and the automatic hobbing cycle make it very convenient to operate.

Unusually close tolerances assure correct spline fits, and the machine is so designed that the original accuracy is maintained throughout a long period of service.

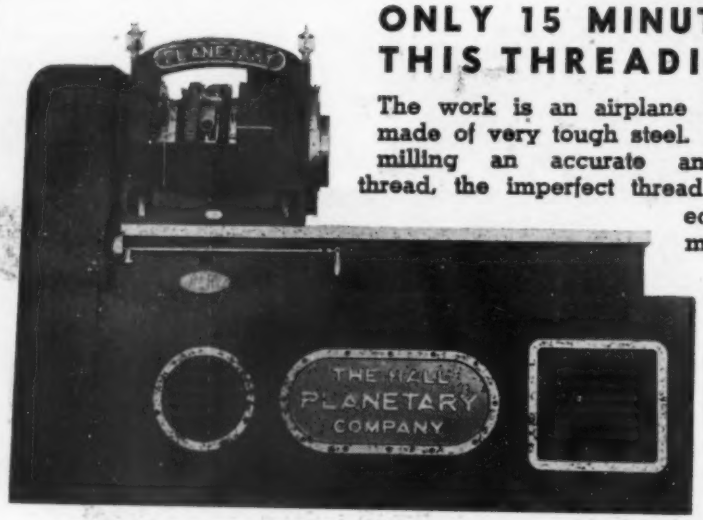
Two sizes: No. 5M - 8" diameter, 48" between centers. No. 6M - 8" diameter, 24" between centers. If your work includes helical gears, worms or screws, ask for information on the Adams Gear Hobber and Thread Miller.

THE ADAMS COMPANY

1905 BRIDGE STREET
DUBUQUE, IOWA, U.S.A.

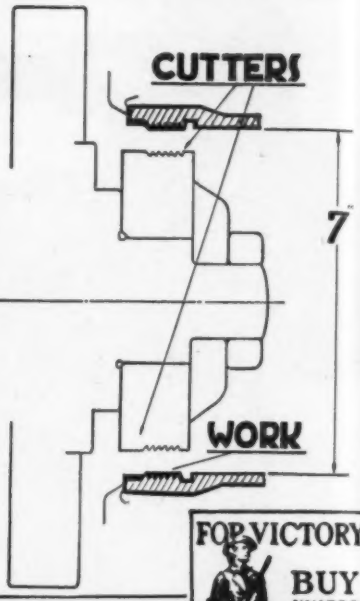
1883 — Our 60th Year — 1943

PLANATHREADING



ONLY 15 MINUTES FOR THIS THREADING JOB

The work is an airplane propeller hub made of very tough steel. In addition to milling an accurate and concentric thread, the imperfect thread or "feather edge" is removed at each end.



Let Hall solve your threading or milling problems.

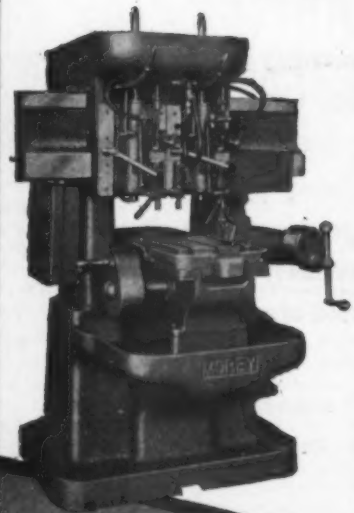
HALL PLANETARY MILLER

HALL PLANETARY CO.

FOX & ABBOTSFORD AVE., PHILADELPHIA, PA.

MOREY
DESIGNED AND BUILT
For PRECISION Plus PRODUCTION

MOREY VERTICAL PROFILER AND MILLING MACHINE



Over 2000 Morey Profilers in continuous service assuring speedy production for the United Nations in duplicating small parts.

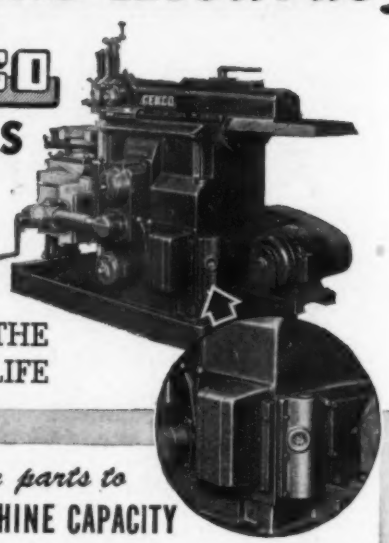
Cross head is balanced on vibration-free cross rail . . . Clearance between spindle and table easily increased or decreased . . . Spindles mounted on precision bearings . . . Ball bearings throughout . . . Slides ride on scraped ways and are adjustable against future wear.

Ample provision for lubrication . . . Simple adjustment takes up backlash . . . No chatter marks on work . . . Table working surface, 12¾" x 15"

Ask for Circular No. 680A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

Extreme Accuracy
WITH
GEMCO
SHAPERS



Exclusive!
"LUBRIGARD"
PROLONGS THE
PRECISION LIFE

Precision parts to
PEAK MACHINE CAPACITY
even by operators new to industry is an indication of Gemco Shapers accuracy.

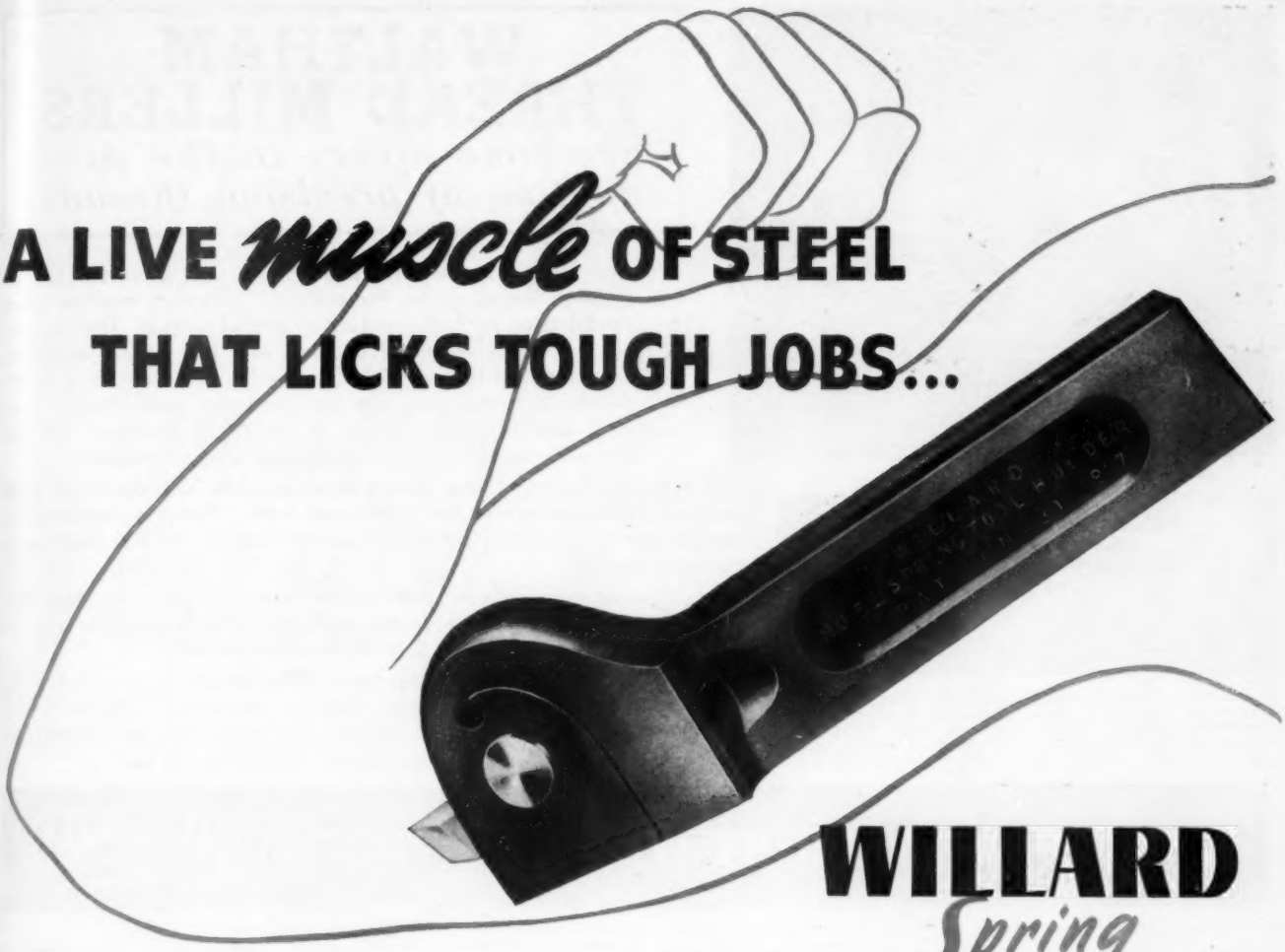
Lubrigard insures adequate lubrication maintaining accuracy during a lifetime of profitable operation.

Available in Plain, Production, and Universal types. Up to 24" stroke.

Write for Bulletin GC-12A. Good Deliveries.

GENERAL ENGINEERING & MFG. CO. ST. LOUIS MISSOURI

A LIVE *muscle* OF STEEL THAT LICKS TOUGH JOBS...



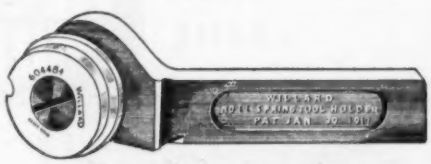
WILLARD *Spring* TOOL HOLDER

For Threading and Forming

Right hand offset. Made in 3 sizes for 1/4", 5/16" and 3/8" square bits. Furnished with hardened wrench and one high speed cutter.

Resilient strength, not rigid inflexibility, is the secret of Willard Spring Tool Holders. It's the reason why these Holders are so successful in preventing cutter breakage and damaged work . . . why they can be used for fine or coarse threading without danger of chatter or tool marks . . . why they can handle faster feeds with a heavier cut . . . why they are so adaptable to a wide variety of work . . . and especially why you should specify Willard Spring Tool Holders for economy, efficiency and accuracy!

Write for descriptive booklet



FORMING TOOL HOLDER

Straight and right hand offset. For cutter ⅝" x 2" diameter. Furnished with hardened wrench and one soft blank cutter.

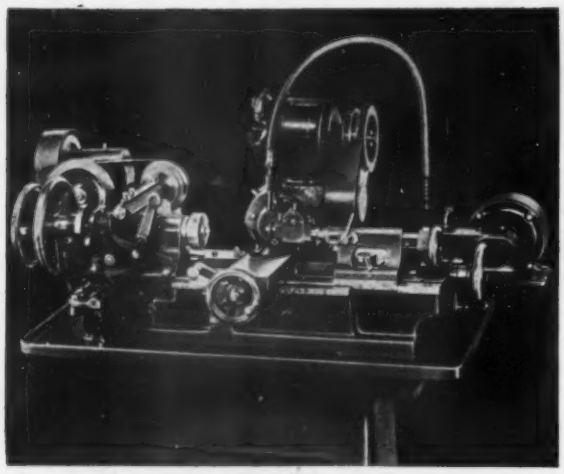
AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

342 West Putnam Avenue, Greenwich, Conn.

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy" Guns

GREENWICH • STAMFORD • BRIDGEPORT • NEW YORK



WALTHAM THREAD MILLERS

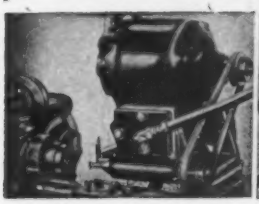
are time-savers in the production of precision threads

Whether for tool room or the production requirements of standard or other thread forms, these sturdy improved machines can be depended on for high production and accuracy. Their versatility is practically unlimited because with the cutters available not only standard threads but also special forms including V, N, Whitworth, Buttress, etc., can be produced with utmost convenience and precision. Work up to 3" in diameter can be handled although 2" or less in diameter is recommended.

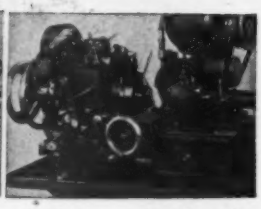
These machines feature three motors which provide individual and wide speed change and reverse for cutter and work. Pump is operated at constant speed. Greater rigidity of cutter head is another feature in improved design.

Standard equipment includes push button control, automatic stop, follow rest, one milling cutter, indexing device, 5 pitch lead screw and 13 change gears for cutting from 5 to 40 threads per inch.

Extra equipment available include: taper attachments, gears for cutting metric threads, metric lead screw, relieving attachment, special heads for internal and multiple thread cutting, and automatic cam operation.



Machine equipped with Internal Threading Attachment having special motor driven cutter head.



Machine equipped with Relieving Attachment. A special work head replaces lead screw.

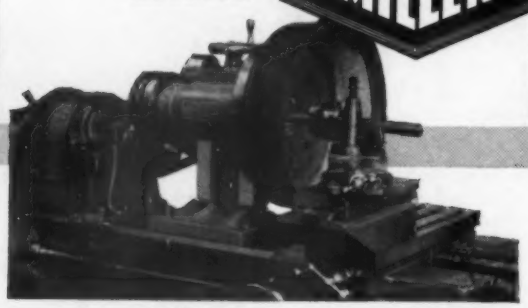
Full and complete details available promptly on request.

WALTHAM MACHINE WORKS WALTHAM MASS. WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

Swing 16 inches

ON A 9-INCH LATHE

GLOBE MILLER



Attached in three minutes or less, the Globe Miller increases swing of your lathe 5 to 10 inches, depending on lathe size, permitting larger turning operations as shown above. With accessories, it performs practically all types of precision milling. Used extensively by U. S. Government. Write today.

GLOBE PRODUCTS MFG. CO.
3382 Robertson Boulevard Los Angeles, California

Write for Bulletin

STEVENS MILLING MACHINE VISES
5 in., 6 in. and 7 in. sizes
All parts interchangeable
JOHN B. STEVENS INC.
474 Canal St., New York 13, N.Y.

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 ¼ in.

Write for illustrated bulletin

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

ROCKFORD MACHINE TOOL CO.

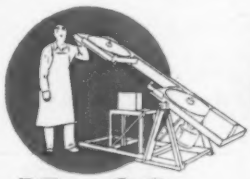
Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers
ROCKFORD, ILLINOIS, U. S. A.

It's a fair question

WHY GET A WELLS NO. 8?

WELLS No. 8
Capacity: Rectangle—8" x 16"
(spec. bowed guides)—5" x 24"
Rounds—8" dia.
Speeds: ft. per min. 60, 90, 130
Motor—Specifications optional



No. 20
Designed for cutting risers off propeller blades

No. 12
Heavy duty production Saw

No. 9
General Foundry Saw

STOCK STANDS
Indispensable item for your shop

Wells SAWS
THE SIGN OF SERVICE

Here's why!

VERSATILE — Wells No. 8 Metal Cutting Band Saw will cut a wide variety of metals in various shapes. In single or ganged-up work it will take overall sizes up to 8" x 16" rectangles or 8" rounds.

ACCURATE — Vibrationless operation assures uniform cutting.

FAST — The continuous cutting method employed insures cutting speed for the type of stock being cut. Adjustable to 3 speeds.

ECONOMICAL — Cutting capacity and quality are paramount factors in choosing a WELLS Saw. Then too, it requires but a ½ H.P. motor and 2' x 6' of floor space.

Ask your mill-supply dealer to show you a WELLS, Model 8, in actual operation — you'll like its performance.

A large stock of blades is available at all times

To get complete specifications on WELLS Saws, write for the new WELLS Catalog.

Wells Has Established Leadership

WELLS MANUFACTURING CORPORATION

Wells METAL CUTTING BAND SAWS

505 ROOSEVELT ROAD • THREE RIVERS, MICHIGAN

NOW Speed-up PRODUCTION with FAMCO PRESSES

EXCLUSIVE ADJUSTABLE GIB

Famco Presses are speeding production and assembly jobs in war plants throughout the nation. They are adaptable to a multitude of operations . . . as above, where a Bench Type Arbor Press is flaring insulation on armature cores of Dumore aviation motors. Only Famco Arbor Presses are equipped with adjustable gibs for front and side plate adjustment to compensate for wear, eliminate "shimmy" and assure perfect ram alignment at all times. Write for facts on the complete Famco line. Famco Machine Company, 1316 18th Street, Racine, Wis.

Bench Model Arbor Press

BENCH AND FLOOR MODEL ARBOR PRESSES

Famco builds 32 stock sizes of Arbor Presses in floor and bench models. Available pressures range from one-half to 15 tons in three types of presses . . . plain lever type, simple ratchet type, and combination compound and simple ratchet type. Pilot wheels in three different sizes can be furnished for all models of Famco Arbor Presses. Floor stands are available for mounting bench models if bench-mounting is not desired. All essential service parts carried in stock. Consult with Famco engineers about the right size and type of Arbor Press for your particular job.

Floor Model Arbor Press

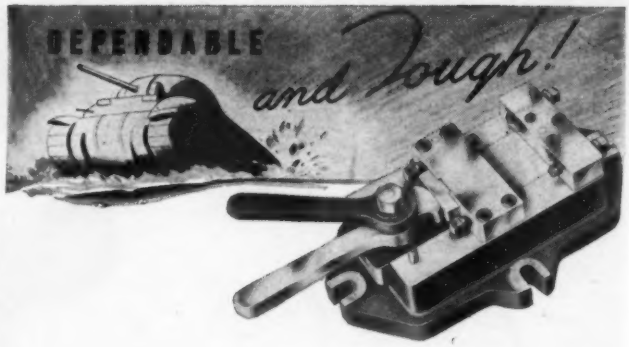
FAMCO FOOT PRESSES

Available in both bench and stand-mounted types, Famco Foot Presses are built in 10 different sizes and models. They are sturdily constructed of semi-steel and are accurately machined for long, trouble-free operation.

No. 15 Foot Press

famco

Foot and Arbor PRESSES



PRODUCTO CAM LOCK VISES

For production milling jobs, this vise permits extra rapid clamping with "one hand" operation. The front jaw is fixed and takes thrust of the milling action. The rear jaw is controlled from the quick-acting, cam-faced lever handle and locked with eccentric lever—one operation. Made in 3 sizes with 4", 5" and 7" jaw widths.

Write for circular on Producto Vises

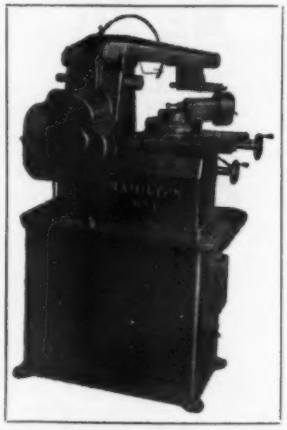
THE PRODUCTO MACHINE COMPANY
3017 MEDBURY, DETROIT, MICH.
998 HOUSATONIC AVE., BRIDGEPORT, CONN.

HAMILTON

SWISS TYPE

GEAR HOBBERS

. . . for accuracy and speed in hobbing PINIONS, GEARS and SECTORS.



TWO MODELS

No. 00 SPUR GEAR HOBBER for work up to 2" dia.

No. 1 SPUR and SPIRAL GEAR HOBBER (illustrated) for work up to 6" dia.

Write for further details to

TRIPLEX MACHINE TOOL CORP.
Exclusive Sales Agents
125 Barclay St., New York, N. Y.

HAMILTON TOOL CO., Builders
Hamilton, O.

"Ask ETNA about Swaging . . ."

● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

The ETNA MACHINE Co.
2400 MAPLEWOOD AVE. TOLEDO, OHIO

PULL HERE
HOLD HERE
DOALL
PRECISION SAWS
FOR CONTOUR SAWING OF ALL METALS AND OTHER MATERIALS
FASTEN LOOSE END UNDER CLIP
IMPORTANT
To get best results use the correct saw and the correct cutting speeds for each job.
Consult a DOALL Job Selector, Dial or Saw Booklet
TESTED AND GUARANTEED
USE OF DOALL
PRECISION BAND SAWS
REMAINING STOCK
USE OF DOALL
REMAINING STOCK
LOOK FOR THE TRADEMARK
THE DOALL CO.
DES PLAINES, ILLINOIS, U. S. A.

I'll Take This One"

● And with a DO-ALL Saw in his hand, he's making a good choice, because DO-ALLS are up-to-the-minute, hard-toothed and will increase cutting efficiency to an amazing degree.

No matter what you saw—metals, alloys, plastics, magnesium, aluminum, plywood, laminated materials, builders board, rubber, wood, etc. — there's a DO-ALL Saw specified for that material. No hit or miss, the right saw for the job, every time.

These Band Saws, first designed to fit DO-ALL Contour Machines, are now available for most any sawing machine. 100 feet in each metal Strip-out box.

Send for new DO-ALL Band Saw circular.

FREE LABORATORY TESTS

The DO-ALL Research Laboratory is at your service. Send your tough cutting problems for the DO-ALL engineers to solve. You'll receive promptly a written report of their findings and recommendations.

THE DOALL COMPANY

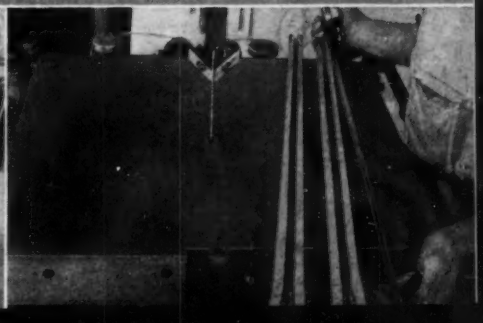
1210 THACKER STREET DES PLAINES, ILLINOIS

DO-ALL Offices in 25 cities, with a staff of trained engineers to give you quick service on Band Saws and Files, Contour Machines, Gage Blocks and Surface Grinders.

MMER DIE—Used to trim forgings to size. ommended to this Ohio firm the use of a 10- h ¼" wide DO-ALL Saw. Running at 150 m. the job can be done in 1 hour, 40.6 minutes.

SHEET FORM CASTINGS—One piece 21 x 20" the other 24 x 20", both ½" thick, sent in by a railroad. Recommended they use a 14-pitch ½" wide DO-ALL Saw. Run at 150 f.p.m. both pieces can be finished in 9 to 10 minutes.

MACHINE GUN BARREL—Sent in by motor firm doing war work. It was found the best way to split these 50 caliber barrels 36" long, for inspection, was to use a 6-pitch, 1" wide DO-ALL saw and reduce velocity to 90 f.p.m. Cut in 51 minutes.



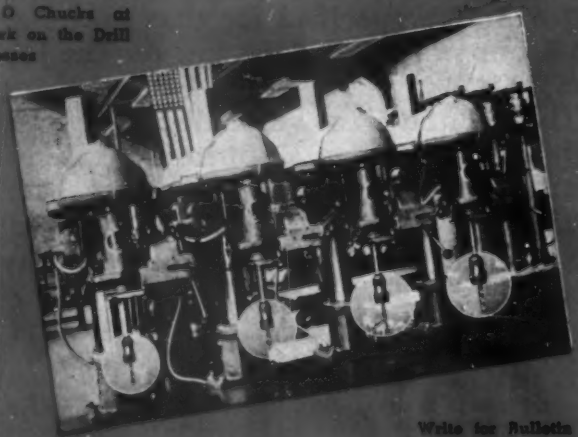
Knock-Out DRILL CHUCKS

KEYLESS SELF-ENERGIZING

● ALL Drill Chucks hold drills. But THERE IS A DIFFERENCE! K-O Chucks are built with specially heat treated, floating jaws which are your insurance for absolute accuracy and your guarantee against drill shank chewing. A twist of the finger tips is all that is necessary to tighten and hold the drill. From then on K-O Chucks tighten themselves. Another twist of the finger tips and the drill is released.

Made in five sizes to accommodate drills ranging in size from 0—⅞".

K-O Chucks at work on the Drill Presses



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KNOCK-OUT

K. O. LEE CO.

Aberdeen, South Dakota

Cartridge Case Dies

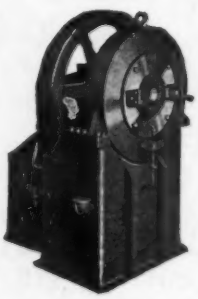
. . . WITH TALIDE NIBS made of Solid Tungsten Carbide, are producing millions of primer cups, small arms ammunition cases and jackets, and cartridge cases in sizes 20 m/m to 105 m/m with Better Finish, Longer Life, Closer Tolerance and Fewer Rejects . . . including cupping, drawing, tapering, sizing and pointing operations.

TALIDE

METAL CARBIDES CORPORATION

YOUNGSTOWN, OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS



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TORRINGTON

ROTARY

SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.

56 Field Street — Torrington, Conn.

BAUMBACH

STANDARDIZED DIE SETS

BETTER-MADE

DIE SETS

AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.

Machined Steel — Semi-Steel

Send for our new catalog

1812 South Kilbourn Ave., Chicago, Ill.

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

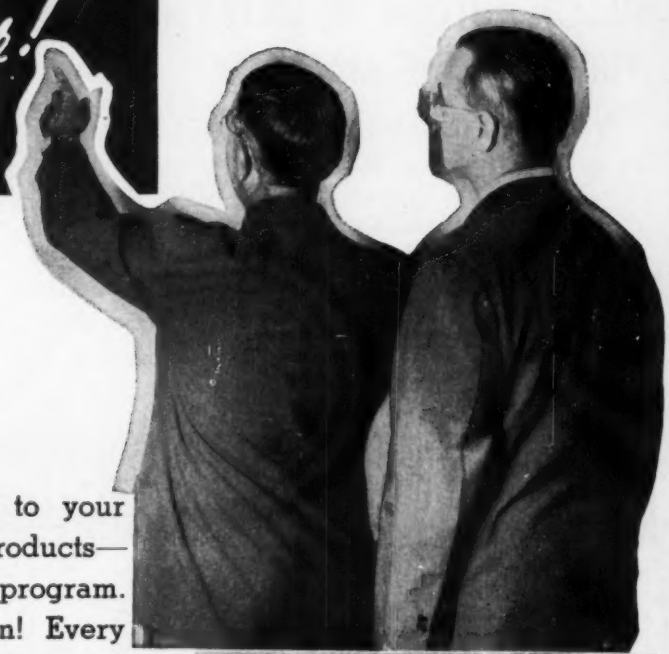
See our Advt. on page 190, Dec. 10, '42 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.

Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: Arthur Jackson Mech. Tool Co., Toronto and Montreal.

JLLI

Yoder Roll-Forming Machines — that's the Answer!



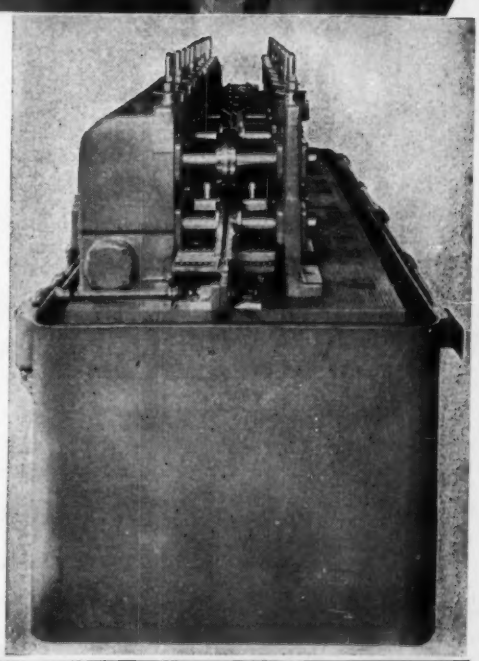
AND PERHAPS... IT'S YOURS!

● Roll back or roll forward! Convert back to your former line or converge forward on new products—Yoder Roll-Forming Machines fit into every program.

The possibilities of roll-forming are legion! Every metal working industry can use it to advantage somewhere along the line. Not only "strip" formed, but relatively solid sections can be reshaped. Any manufacturer with a "parts" problem is invited to send sketches and notes to The Yoder Company for an *answer.* Object: The introduction of the latest in Yoder Roll-Forming Machines and its Auxiliary Equipment.

The Yoder Company has pioneered in the engineering and manufacturing of this equipment for over thirty years. Its record has been such that many say, "YOU GET THE IMPROVEMENTS FIRST FROM YODER".

THE YODER COMPANY • CLEVELAND, OHIO • U. S. A.



METAL • WORKING • PRODUCTION • MACHINERY

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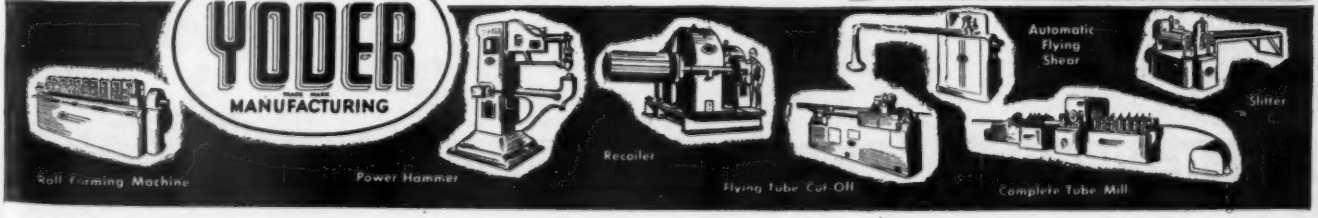
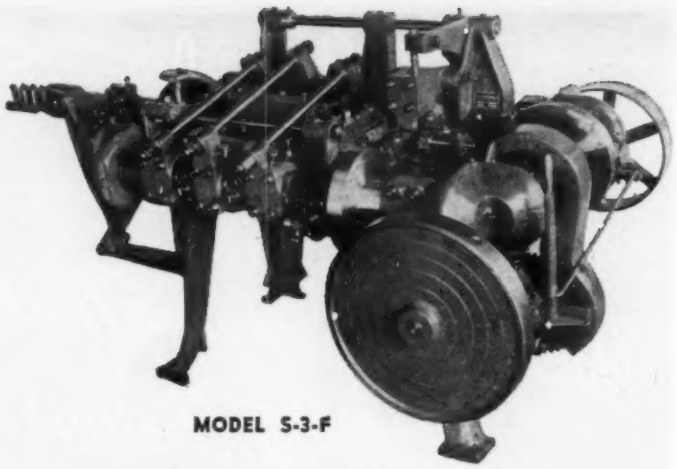


STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES



MODEL S-3-F

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

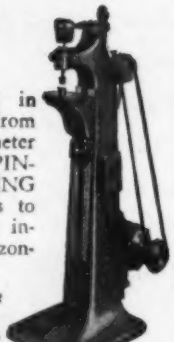
Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

• •

We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO... *Bridgeport, Conn., U.S.A.*

GRANT



RIVETERS — PIONEERS in their line—head rivets from smallest to ⅜" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindies.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co.
HUDSON, N. Y.

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

Vascoloy RAMET

TANTUNG CUTTING TOOLS — DIES

439

VASCOLOY RAMET CORP. • NORTH CHICAGO, ILLINOIS

Metal Stampings "DUPLICATED WITHOUT DIES"

SHEARS

BRAKES

BENDERS

If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

Send for this Catalog . . . **"METAL DUPLICATING WITHOUT DIES"**

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

O'NEIL-IRWIN DI-ACRO PRECISION MACHINES MFG. CO.

311 EIGHTH AVENUE SOUTH
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ALL TYPES OF BORING MILL TOOLS DESIGNED AND MANUFACTURED

- BORING BARS
- ADAPTERS FOR END MILLS
- ARBORS FOR SHELL END MILLS
- COLLET CHUCK ADAPTERS
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- REDUCING SLEEVES
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- HEAVY DUTY BORING BARS
- TOOL BITS—SQUARE OR ROUND TYPE
- HEAVY DUTY FLOATING HOLDERS
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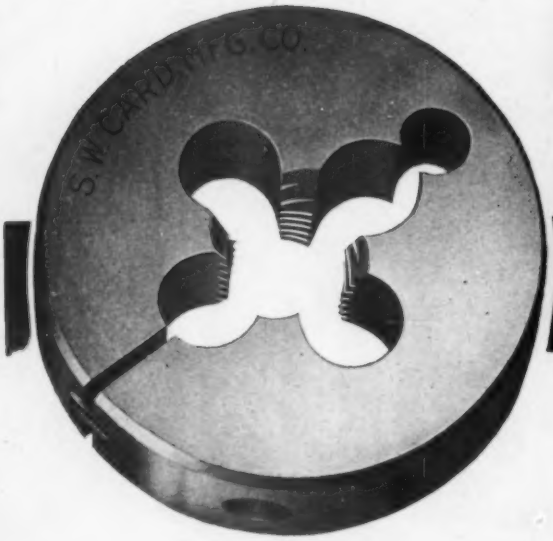
- RECESSING TOOLS

Kindly Send in Drawings or Specifications for Quotations on Special Tools

Scully-Jones
AND COMPANY
1901 SOUTH ROCKWELL STREET • CHICAGO U S A



CARD DIES ARE AVAILABLE THROUGH LEADING DEALERS

CARD DIES

Stand the gaff of toughest threading demands . . . . . .

Under today's conditions, when quality must be maintained regardless of quantity demands, it is good to know that CARD DIES can be depended on for production threading.

The CARD line includes Spring Screw Threading Dies of carbon steel in machine screw and fractional sizes, Adjustable Round Split Dies for both hand and screw machine work in machine screw, fractional, and pipe sizes.

In addition CARD manufactures Hexagon Rethreading Dies, Solid Square Pipe Dies and Bolt Dies.

Consult the Card Catalog for your requirements. Send for your copy today.

The CARD Quality

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO.
STORES: New York: 61 Reade St. Chicago: 11 South Clinton St. Detroit: 6540 Antoine St.,
Seattle: 568 First Avenue, South Los Angeles: 168 South Central Avenue San Francisco: 121 Second St.

MOREY *Designed and Built FOR Precision PLUS Production*

VERTICAL SHAPERS 8"–12"–14" STROKES

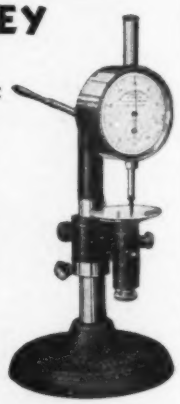
Four cutting Speeds . . . infinite feed variations quickly selected . . . Directional control for all movements . . . Rapid power movements in all directions . . . Brake for Ram automatically applied...OPERATOR CONTROLS MACHINE WITHOUT MOVING FROM HIS WORKING POSITION . . . Timken Bearings for Bull Gear, Shaft and Rotary Table . . .

ACCURATE, POWERFUL, FAST, FINGERTIP CONTROL

Ask for Circular No. 726A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

RANDALL & STICKNEY
Universal Gauge



for rigid inspection of a wide range of parts . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch; height 9¾"; weight 5 lbs., 1¼ oz.; depth from frame to spindle 1⅞".

Can be supplied with sliding head and table; also on a stand with throat 3" deep.

Full details on request

RANDALL & STICKNEY
Makers *Waltham, Mass.*

KNIGHT VERSATILE MILLERS ACCURATE RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

Savings in METAL, TIME and MACHINES because of PEERLESS FOUR-SIDED SAW-FRAME ASSEMBLY

At the Walsh-Weidner Boiler Plant of Combustion Engineering Co., at Chattanooga, Tenn., this 14-inch Peerless Hydraulic is cutting large size boiler tubes. The Peerless Backing-Plate Blade Support, automatic blade lift on return stroke and compensating adjustment of pressure on the blade make Peerless the ideal tool for this work.

Peerless *High Speed* Precision Sawing Gives EXTRA Production

Taking as little as 1/16 in. for the cut and *sawing "straight as a die,"* Peerless Metal Cutting Saws save enough metal to make "extra" pieces from the stock being worked. *Time* is saved because maximum tension can *safely* be put on the saw blade without bowing, tilting or undue breakage. *Smoothness* of operation lengthens machine life and increases operators' efficiency by banishing nerve-nagging chatter. You've everything to gain by checking up on the Peerless Four-Sided Saw-Frame Assembly and other Peerless features that give extra production on high-speed precision sawing. Mail the coupon for estimate of cutting time on your toughest operation.

No Other Metal Cutting Saw Has Such Precise Blade Control

The Peerless Four-Sided Saw-Frame is distortion-proof. It surrounds the blade and the work. The blade is locked rigidly in place. The Backing-Plate Blade-Support permits extreme tensioning with no tilting or bowing. And the Saw-Frame Guide, fitted with eight bearings with renewable and precision-ground ways, assures cutting to the closest possible tolerance with no vibration or variation. Only Peerless offers these exclusive features. Send for descriptive folders.

PEERLESS MACHINE COMPANY
1600 Junction Avenue • Racine, Wisconsin

PEERLESS MACHINE COMPANY, Dept. AM-943, Racine, Wis.
Mail cutting time estimate for.....

☐ Mail catalog on Hydraulic type Saw for High Production Cutting
☐ Mail catalog covering Vertical type used for Die Block Work
☐ Mail catalog on Mechanical type Saw for production cutting
☐ Mail catalog on general utility and maintenance Saws

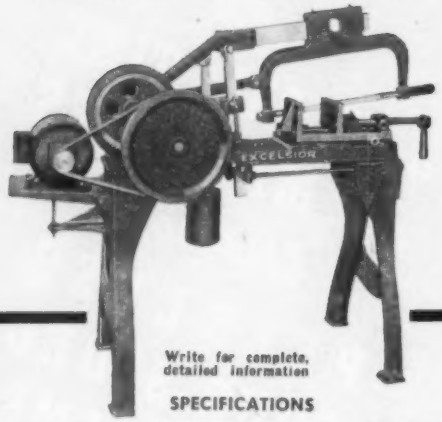
Company.....
Individual.....
Street.....
City.....State.....

Peerless
THE ONLY METAL CUTTING SAW
WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE *Sawing* DEMANDS PEERLESS BLADE CONTROL

FASTER CUTTING and LONGER BLADE LIFE

are assured by this powerful economical HACK SAW . . .



Write for complete, detailed information

SPECIFICATIONS

Length of Blade— 12" or 14"
Stroke—6"

Cutting Capacity— 6" x 6"

Swivel Vise adjustable to 45° angle

The No. M2A Royersford-Excelsior Power Hack Saw, with V-belt motor drive, combines features which assure fast cutting with blade breakage reduced to a minimum.

Blade is lifted automatically on return stroke and placed in contact with work on cutting stroke. Saw feed is by gravity, another feature which contributes to protection against blade breakage and buckling and at the same time assures greater cutting efficiency.

Other features include drive through milled gears which results in more power, and an automatic shut off which stops blade on backward stroke and disengages gear on motor.

Interchangeable swivel vise can be quickly replaced when necessary. Immediate deliveries available.

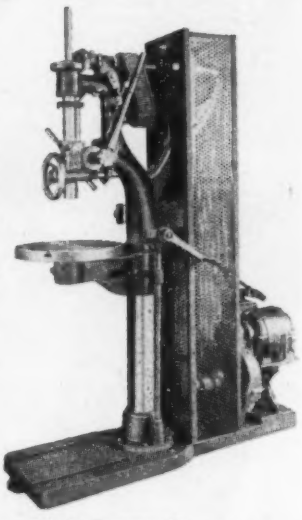
ROYERSFORD FOUNDRY & MACHINE CO., Inc.
200 MAIN ST., ROYERSFORD, PENNA.

DRILL HOLES UP TO 1½" *with speed and perfect accuracy on this* IMPROVED MOTOR DRIVEN BACK-GEARED MACHINE . . . .

The 21-inch Royersford-Excelsior Upright Power Drill is modern in every detail and combines simplicity and speed with strength and rigidity.

Gears are machine cut, bearings are generous in size. By merely sliding back gears, a quick change can be made from a plain drill to a back-geared machine. Spindle is equipped with ball thrust bearings top and bottom.

Other features include: 8 speeds with 3 distinct and complete feeds—power, hand screw and lever; spindle is counterbalanced and provided with automatic stop and quick return; table is raised and lowered by quick action screw.



SPECIFICATIONS

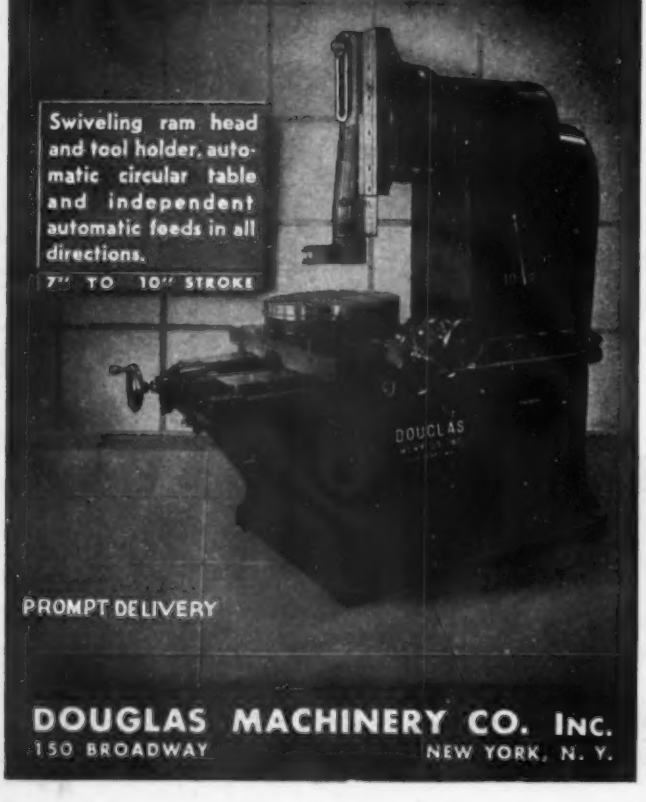
Distance Table to Spindle—20"
Diameter of Table—18"

Spindle Traverse—9"
Hole in Spindle—No. 3 or No. 4 Morse Taper

Send for complete detailed information. Immediate deliveries now available.

ROYERSFORD FOUNDRY & MACHINE CO., Inc.
200 MAIN ST., ROYERSFORD, PENNA.

DOUGLAS PRECISION SLOTTER



Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.

7" TO 10" STROKE

PROMPT DELIVERY

DOUGLAS MACHINERY CO. Inc.
150 BROADWAY NEW YORK, N. Y.

Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.

Also, Lead Hammers, sizes 1 to 15 lbs. always in stock.

JOHNSON TOOL CO., INC.
East Providence Rhode Island, U.S.A.

LUERS

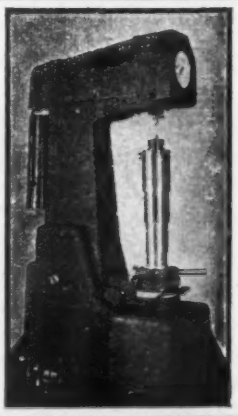
Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

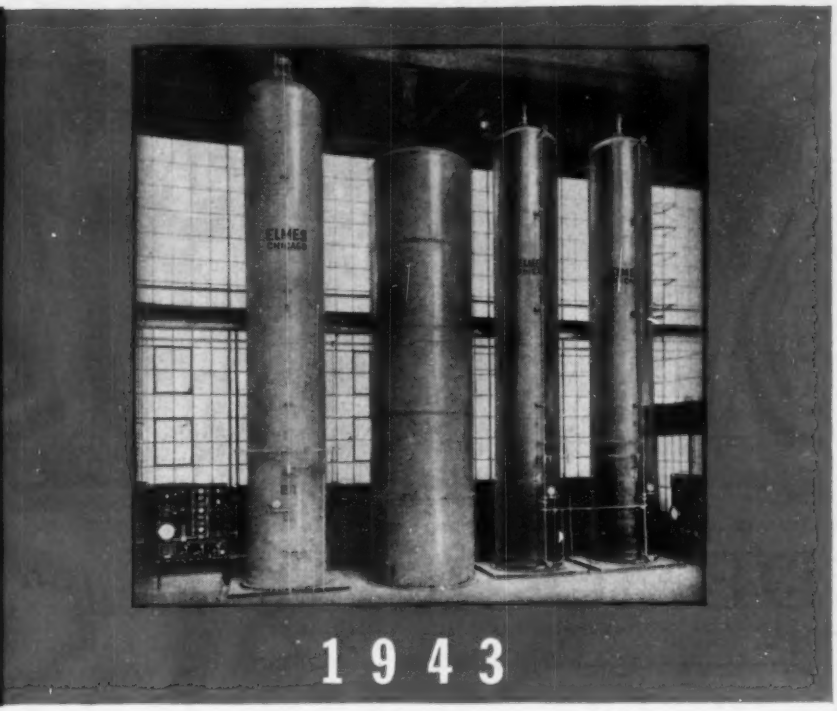
"ROCKWELL" HARDNESS TESTER

BETTER and BETTER EACH YEAR SINCE 1921



WILSON
MECHANICAL INSTRUMENT CO., INC
Concord Ave. New York

EVOLUTION OF AN ACCUMULATOR!



Half a century ago, weighted accumulators similar to the old Elmes model shown here were widely used. Actually the *first* Elmes weighted accumulator was built in 1870. This type was cumbersome, required much floor space, and the pressure variation was great, as the chart shows.

Today, the weighted type has largely been replaced by the vastly more efficient air-ballasted, pistonless hydraulic accumulator. The Elmes high and low pressure installation pictured here represents the highest development of this modern system. Note the uniformity of pressure as compared with that of the old weighted type—line shocks are completely absent. There are no large moving parts, no special foundations are required, internal packings are eliminated, floor space is conserved. The Elmes patented control system insures safe, fool-proof operation.

Engineering records indicate that Elmes was one of the pioneers in building air-ballasted hydraulic accumulators on this continent. Likewise, many of the first installations of other hydraulic equipment were made by the Elmes organization. Those facts are important today because they are evidence of the Elmes experience and leadership which dates back nearly a hundred years.

The modern Elmes *standard* line of hydraulic equipment includes presses, accumulators and other hydraulic machines of every type—for virtually every kind of heavy and light manufacture. And in the adaptation of hydraulic design for *specialized* purposes, the inventive skill and sound methods of Elmes engineers are solving new and complex production problems for countless manufacturers. Elmes should be *your* first thought for cost estimates or engineering collaboration on hydraulic accumulators and all hydraulic equipment.

Ask for our new Elmes ACCUMULATOR BULLETIN, together with information and literature on any other Elmes Hydraulic Equipment. Simply write your name, firm name and address on the margin of this page, tear it off and mail to us. Indicate type of equipment in which you may be especially interested.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 1001-1013 Fulton St., Chicago.

ELMES HYDRAULIC EQUIPMENT

Also Manufactured in Canada

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

VOTE HERE
This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.

DEMOCRATS *need "Seed Money," too*

Seed Ideas and Seed Money

Whether you run a whole business, a plant or a section, the very fact that you hold this magazine in your hands indicates that you are interested in *improvement*.

Did you ever stop to think that that instinctive desire to find a better way of doing things is the fundamental driving force of America?

It is.

If allowed to function in an environment economically and politically favorable to industry, this American instinct for improvement can carry us forward to undreamed standards of living and of culture.

The only barrier to constant improvement is lack of public understanding.

Industry cannot have a favorable environment, however, until industry itself clearly defines its objectives, and explains them clearly to every citizen *in terms of social progress*.

This Seed Money advertisement (reprinted from the McGraw-Hill newspaper campaign now running in Washington, New York and Chicago) is intended as a starter in a nation-wide process of education on the source of good living.

Some companies are running the Seed Money Advertisements locally, over their own signatures. Others are starting their own campaigns. Either way, the Seed Idea is being planted.

If you would like to reproduce this message in your plant city, free mats and booklet reprints (sold at cost) are available.

James H. McGraw, Jr.
President

McGraw-Hill Publishing Company, Inc.

NOW don't get excited, folks, this isn't a political advertisement. We've got some thoughts on our mind about how to make big problems simple, and we are using the word "democrat" the way the men who thought it up used it.

More than 2,000 years ago, the Greeks decided to quit believing in Superman, and they invented this word to express their general idea.

► Every schoolboy knows how that idea was pulled off the shelf sometime back, and a form of government hammered out that would allow Joe Doakes enough personal elbow room to do his stuff in the world.

Every schoolboy knows, too, that what followed—particularly in America—was the most rapid development ever known.

Within the memory of living men, we have traded the economy of the hoe for the tractor, the muscle for the motor, the eye for the electronic tube.

So vast has our mechanical might become that by shifting the ends of our production lines from the garage, the kitchen and the living room to the skies above Italy, Germany and Japan, we are changing the history of the whole world.

With all this glory to his credit, wouldn't you think the common man would know how he did it,

[FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18), N.Y.]

DEMOCRATS *need "Seed Money," too* (cont'd)

and how to keep on the road to better living after the war?

He doesn't know, because he discounts the part that his own, native love for *improvement* plays in our national life.

This love for *improvement* started on pioneer farms. It continued in millions of garages and kitchens. It rides with every American gunner today.

American *improvement* is essentially a Joe Doakes affair. Here's how it works:

1. Joe invents something and invests Seed Money in equipment and materials to make it.
2. People buy it.
3. That makes good paying jobs.
4. Joe invests more Seed Money to improve his product or his method of making it.
5. More people buy it.
6. That makes more good paying jobs.
7. Joe invests more Seed Money in more and better machines, to get volume production.
8. So, Joe lowers his price.
9. Still more people buy.
10. That makes more good paying jobs.

Try to figure out any other foundation for American wealth, leisure, culture, fighting strength or material possessions!

► This simple progression, multiplied by millions of instances, explains why "Seed Money" is so important in our national life.

Seed Money is used every time a product or a machine is improved, because Seed Money means "that part of profit which is 'plowed back' into a business."

Joe Doakes will need his Seed Money, to attract customers and create jobs when this war is over. But a dangerous percentage of Joe's Seed Money is being blotted up in the Excess Profits Tax.

Perhaps our government intends to return some of this money after the war, as a loan. But this would mean another government bureau, more Federal employees, all of which will further increase the cost of government. But above all—Business will not be free to "take a chance" with this money. It belongs to the government. Hence, the "take a chance" spirit, the life breath of progress, will be hobbled just when Americans need it most.

► There is a simple and much more effective way to supply our American industry and commerce with Seed Money.

Change our tax laws to permit industry and business to set aside from present earnings the tax-free Seed Money that they will need to reinvest in improvement of plant, products or essential operations to create jobs after the war.

To put this simple, effective procedure into practice, our government must change its attitude toward the source of all improvement—Seed Money. To bring this about, remind your Congressman that:

"Industrial Progress
is the Source of all Good Living."

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

24 publications, which gather "war-news" from the "war-production-front" through a staff of more than 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.00 per 100; $10.00 per 1000.)

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK (18), N. Y.

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

American Machinist • Air Transport • Aviation • Aviation News • Bus Transportation • Business Week • Coal Age • Chemical & Metallurgical Engineering • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics • Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets • Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Wholesaler's Salesman

Business Publishers International Corporation, an affiliate, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation

THIS PORTER-McLEOD CUTTING OFF MACHINE *PAYS FOR ITSELF* IN STEPPED-UP PRODUCTION

If your cold metal sawing involves cutting stock from 3 inches up, here's the machine to put such operations on a production basis.

This new Porter-McLeod 8" machine is particularly advantageous on larger sizes of stock. *By supporting the blade close up to the* rim of the blade and *pulling* the blade through the cut, buckling of the saw is prevented and accuracy maintained.

The standard feed of this machine is 3 inches a minute but can be stepped up for cutting brass and non-ferrous metals.

Because of the great leverage exerted on the blade through the Porter-McLeod Pull Method of Drive and the support at the rim of the blade, this machine requires less power and assures a straight cut. Multiple units can be cut at one time on the Porter-McLeod by means of the upper feed of the machine which permits nesting of bars.

Explore the great time and money-saving possibilities offered by this modern production cutting off machine. Investigate *NOW* by sending for complete details.

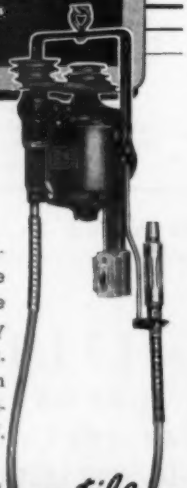
PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

Haskins Does a Great Job of

SAVING MONEY

on Grinding, Sanding, Polishing, Rotary Filing and Wire Brushing Operations



Finishing operations cost less on HASKINS *Flexible Shaft Equipment.*

Men work faster with these easy handling machines. Maintenance costs are less. Machine life is longer—more trouble free. 30 different units provide a specially engineered machine for every kind of work. Write for Catalog 45. See how you can speed production with flexible shaft equipment. R. G. Haskins Company, 2760 W. Flournoy St., Chicago.

HASKINS *Versatile* FLEXIBLE SHAFT EQUIPMENT

Wanted! New Products!

Long-established and well-known company with modern plant for production of precision devices wants new products for post-war manufacture. Particularly interested in small and medium-sized motor-operated tools or appliances. Ideas need not necessarily be completely developed. Send only description of product, indicating purpose, market and advantages for complete, prompt, and confidential consideration. If your idea has possibilities, and will fit into our plans, further arrangements can then be made. Address Research Department,

The Dumore Company, Racine, Wisconsin

Grobet

ROTARY FILES

HAND CUT • MILLED CUT
GROUND FROM THE SOLID

There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. Send for Catalog DR, illustrating the complete line in full size, speed charts, etc.

GROBET FILE CO. of AMERICA

421 Canal Street (1812 F. L. GROBET 1943) **New York, N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

A New Operator takes over

THE essential features of the Sellers Heavy Duty Tool Grinding Machine—simplicity, accuracy, uniformity—are of greater value today than ever before. They permit the operation of these versatile, high production precision tool grinders by newly trained and relatively inexperienced personnel. Even women operators on these machines can grind any cemented carbide or high speed steel, straight or convex curved face tools, including thread tools of any angle of thread or pitch, internal or external, and can accurately reproduce the desired angles or clearances on all the tools. They keep production moving.

WILLIAM SELLERS & CO., INC., PHILADELPHIA, PA.

FOUNDED SELLERS 1848

Sellers

MARK IRON, STEEL and CARBIDES

The Original

Etchograph

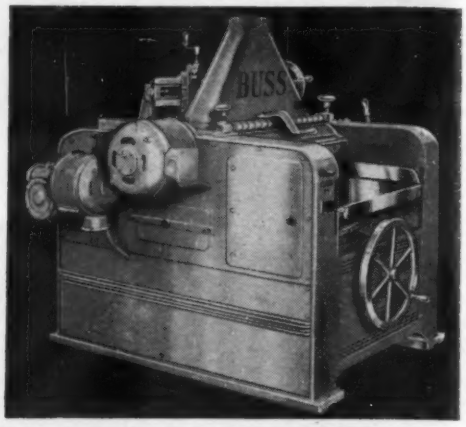
Way

Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

Write for circular and prices

BREWSTER-SQUIRES & CO.
50 CHURCH ST. **New York, N. Y.**

BUSS *Wood Surfacers*



GIVE YOU THE ABSOLUTE PRECISION ESSENTIAL IN PATTERN and JIG MAKING!

—plus faster change-over, greater convenience of operation and the assurance of years of perfect service. Write for Bulletins Type 4-L showing the many patented features which make this the finest of all surfaces for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfaces.

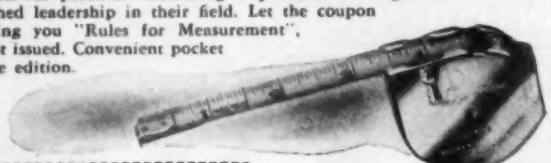
BUSS MACHINE WORKS
228 EIGHTH STREET HOLLAND, MICH.

USE THIS FREE GUIDE TO BETTER *MEASURING*

Here's a "Rule Book" that simplifies the use of steel tapes and wood rules. In it, pictures *show* you, words *tell* you how to use your measuring tools to the best advantage. If your job calls for accurate work to precise dimensions, its 16 pages are crammed with facts and advice, specially valuable to war plant workers.

Conservation is a "must" today, and your copy of "Rules for Measurement" contains specific, practical directions for lengthening the life of your rules by proper care. Step-by-step illustrations and diagrams are provided to make instructions easy to follow.

Included also is a complete list of the simplified wartime line of famous Master rules. These are the most recent, improved units for precision measuring — products of long-established leadership in their field. Let the coupon bring you "Rules for Measurement", just issued. Convenient pocket size edition.



Master Rule Mfg. Co., Inc.
515 E. 136th St., N. Y. C., Dept. 9P

Please send me, without charge, "Rules for Measurement".

Name_____
Address_____
City_____ State_____

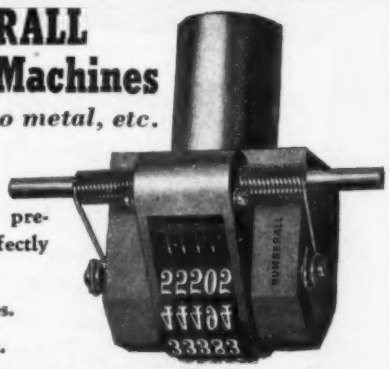
Branch: 541 S. Spring St., Los Angeles, Calif.

MASTER
WOOD AND TAPE RULES

NUMBERALL Numbering Machines

for stamping into metal, etc.

AUTOMATIC
MODEL NO. 50



Sturdy construction, precision build, perfectly aligned numbers.

All sizes of figures.

Write for Catalog.

NUMBERALL STAMP & TOOL CO.
Huguenot Park, Staten Island, N. Y.

CRAFTS

Consistent Quality

ARTHUR A. CRAFTS COMPANY, INC.

GAGES AND TOOLS

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT · CHICAGO

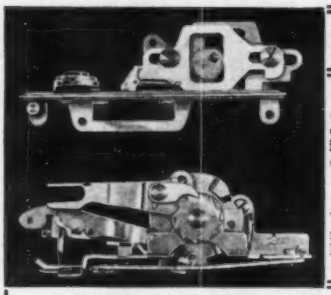
CONTRACT WORK

TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
Drill presses
DoAll contour cutting machine

RELIANCE MACHINE & MFG. CO.
30 Irving Place, New York, N. Y.
established 1922



STAMPINGS and ASSEMBLIES

We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

"Greater Savings with Greist"

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

MACHINES AND PARTS, SPECIAL TOOLS, ETC.
to your specifications

SPECIAL ENGINEERING WORK
. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling
THE A. H. NILSON MACHINE CO. Bridgeport, Conn.

MACHINE SHOP
Facilities include 9" South Bend Bench Lathe, ±2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO. HOCKESSIN, DELA.

DESIGN & BUILD JIGS, FIXTURES & GAGES
REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

KIRK & BLUM
CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY ⅛" AND LIGHTER
THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

QUALITY
SCREW MACHINE PRODUCTS
•••
WALTHAM
SCREW COMPANY
WALTHAM • MASS.

WIRE AND METAL SPECIALTIES
In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

MACHINE SHOP WANTS DEFENSE WORK
Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.
STEPHEN J. LEWIS ENGINEERING CO.
215 Butler St. TRiangle 5-5848 Brooklyn, N. Y.

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.
KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

CENTERLESS GRINDING
Work wanted. (New, Cincinnati ‡2) also, surface grinding; precision lathe, milling, drilling, and cylindrical grinding. Small parts to very tolorances. Good delivery.
PRECISION PARTS, INC.
17 Thompson Street, New York, N. Y. Wa. 5-5518-9

AVAILABLE NOW
CYLINDRICAL GRINDING FACILITIES
Handle Stock to 4" x 13"
IMMEDIATE SERVICE
Let Us Quote You On Turning and Grinding
ACME EQUIPMENT CO.
W. C. Dept.
128 S. Clinton St. Chicago, Ill.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word minimum charge $2.00. (See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED—RATE PER INCH:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., September 3 will appear in the issue of September 16 subject to limitations of space available

---

WANTED

EXECUTIVES *and* CONTACT MEN

A government department in Washington, D. C., is urgently in need of qualified men for both a major and an associate executive position and for several responsible contact positions.

The duties associated with these positions are of a character comparable to those required in similar capacities in the marketing and sale of metal-working, construction and general industrial equipment.

The executive positions call for men of high type, possibly semi-retired or who are prepared to make some sacrifice to place their services at the disposal of their government. These men would operate from government offices in Washington and be resident there. The contact men would be essentially traveling representatives. All positions have salary ratings.

Immediate responses giving details essential for consideration are invited for these several positions

P-657, AMERICAN MACHINIST
330 W. 42nd St., New York, N. Y.

WANTED

Powder Metallurgist—Laboratory Technician

Excellent opportunity with new division of established midwestern concern. To be in charge of research and production of custom fabricated parts.

MIDLAND DIE & ENGRAVING CO.
1800 W. Berenice Chicago, Illinois

POSITIONS VACANT

Machine and Tool Designers for light special purpose machinery.

LLOYD, ROGERS & CO.
Tool Engineers
39 Broadway New York, N. Y.

Layouts for Multiple Spindle
SCREW MACHINES
Our Specialty
Designers and Builders of Automatic Labor-Saving Machines
Universal Machine Builders Co.
Empire State Bldg., New York, N. Y.

Conserve Your Manpower

SELECTIVE SERVICE CONSULTANT will advise on manpower problems, preparation of Replacement Schedule, Manning Tables.

SS-656, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POST WAR PRODUCT

Wanted for purchase or manufacture, by a completely equipped manufacturing plant, which has an excellent sales organization. Write us giving details of your product or item.

BO 627, American Machinist
330 West 42nd St., New York 18, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense plant in Midwest; give experience and full particulars. P-593, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Midwest; give experience and full particulars. P-594, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

HELP WANTED—Young, or middle age, man, technical training preferred, capable of introducing speed and efficiency in medium size machine shop with large and small machine tools. Permanent position if you can produce results. P-638, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DESIGNER experienced on milling machines, wanted by old established machine tool builder with highest rating. Plenty of opportunity for the right man. Communications confidential. P-639, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEERS wanted by machine tool dealer representing outstanding machine tool manufacturers in eastern territory. Salary, expenses, commission. Must be experienced and acquainted in eastern territory. P-640, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DESIGNER WANTED by old established company manufacturing small tools. Splendid opportunity for first class man. Give particulars regarding experience, age and salary expected. P-650, American Machinist, 330 West 42nd St., New York 18, N. Y.

FIRST CLASS MAN WANTED for advertising department of old established machine tool concern. Splendid opportunity for one who can assume responsibility. P-651, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DIE ENGINEER, 35 and over, with good practical experience in design and toolroom, for old established and excellently financed medium sized concern producing automotive accessories and similarly sized stampings. Must design and supervise building of tools independently. Permanent with assured post war outlook. Salary open. Location near Detroit. P-652, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: Machine Designer—Experienced on the design of special machinery and machine tools. This is an excellent opportunity for a first class man interested in a steady position in New England. Only men 35-55 with a record of successful achi vements will be considered. In replying furnish complete information preliminary to a conveniently arranged interview. P-645, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Ollwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

POSITIONS WANTED

MECHANICAL ENGINEER with many years' experience in the production of small, interchangeable parts wishes position with growing, aggressive plant. After-the-war possibilities of more importance than extremely high war salary. Was general manager of gun factory in last war and am at present employed in executive position in defense plant in the east. Can obtain certificate of availability. Excellent references and proved ability. PW-653, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DO YOU NEED A LIVEWIRE for that "dead spot" in your organization that is aggressive with ability and willing to work, with 18 years of practical shop and executive experience. From Apprentice to Assistant to Works Manager in 18 years. Obtained all engineering studies in evenings. 32 years old with family, desires responsible position with firm anywhere that has post war program. Will get release from present employer. PW-644, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MACHINE SHOP EXECUTIVE, graduate M.E., age 46, 29 years' machine shop experience as machinist, supervisor, engineer, and executive, desires position with Eastern Company with post war program. Can supply patented post war items. PW-654, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FERROUS METALLURGIST desires position with reliable steel manufacturer. Will consider only position with definite after war prospects either in United States or in foreign division of American company. Six years' supervisory experience as Metallurgist, Chief Inspector and Plant Superintendent. Present salary $5,000.00 per year. PW-655, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

CONTRACT WORK

WORK WANTED—For advertisements of work wanted see page 304.

WANTED

WANTED—Deckel GK-2 Engraving Machine Milwaukee 1-H Plain Milling Machine Motor driven Surface Grinder, 6 x 18. Write or wire: J. E. Hawley, W. Roosevelt, Phoenix, Ariz.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

SEE PAGE 288
for
Selling Opportunities
(Wanted)
Plants For Sale
Equipment Wanted

IN STOCK!!!

LATHES

Putnam 30" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.
Putnam 26" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.

PRODUCTION LATHE

2—LeBlond No. 9 Automatic Lathes, capacity 9" swing, 16" between centers, geared head, arranged motor drive with motors for 3 phase, 60 cycle, 440 volt service. Equipment includes back facing attachment, oil pump and piping. New in 1929 and guaranteed in first class mechanical and operating condition. Special price for immediate sale.

TURRET LATHES

ACME 1¼" cap., power feed to turret, screw cross slide, bar feed, 6 hole hexagon turret, collets, turret tooling, arranged M.D. 60-3-220/440 volt.
Foster 1" capacity Geared Friction Head, Hand Operated Turret and cross slide, collet, belt drive.
21" Gisholt Universal Turret Lathe with 3¾" hole in spindle, 2-step cone for 5" belt.
Jones & Lamson 3 x 36 Double Spindle, air chuck equipment.
Jones & Lamson 3 x 36 Single Spindle, Geared Head, Single Pulley Drive.

BORING MILLS

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
30" Colburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

GRINDERS

No. 6 Besley Double Opposed Disc Grinder.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
Gorton, double end Disc Grinder, 18" discs.
Greenfield No. 12, Hydraulic Feed, motor drive; cap. swings 15", Grinds automatically ¾" to 5" di., 4" deep. New in 1928.

COILING MACHINES

No. 1 and No. 2 Sleeper & Hartley BX cable coil. mach., ⅜ and ½ in. cap. Last used for speedometer cable. Complete.

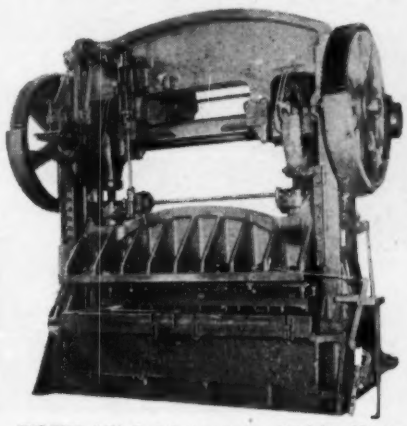
DRILLS

BAKER—#5 M.T.

DRILLING MACHINES

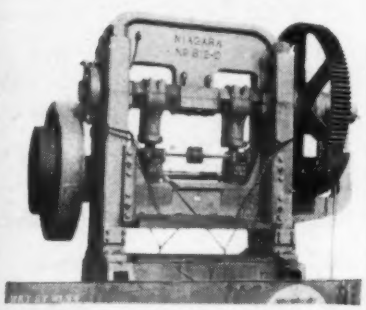
Fox No. 15H mult. spdl. drill. mach., Hyd. feed, 35 No. 1 Morse taper Spindles, 17" x 34" bd., ser. No. 1005, M.D., 10 H.P., 3 ph., 60 cy., 220 v.
Fox No. D31 mult. spindle drill. mach. Drilled for 23 spindles and equip. with 16 No. 2 Morse taper Pwr. fd., 17" x 34" bd. Ser. No. 626, m.d. 10 H.P., 3 ph., 60 cy., 220 v.
Nateo No. 12 mult. spindle drill. mach. Single pulley, B.D., Drilled for 16 Spindles and equip. with 6 No. 2 Morse taper. Power feed.

Toledo 94½-J 200 Ton Press



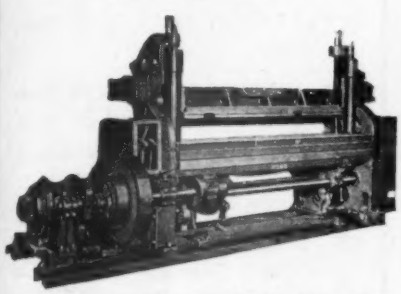
TOLEDO 94½-1' 200 ton press. Straight side tie rod, double twin, direct geared M.D. with 30 H.P. 3 ph. 60 cy. 440 V. motor & Con. Forced feed lub., pneumatic controlled friction clutch & brakes. Bed area—120" right to left x 50" front to back. 12" stroke, 18" sheet height. Bed equipped with spring cushions. Weight approx. 80,000 lbs.
Sanford No. 1½ Production Miller, Rotary Table.
Cleveland Vertical Miller No. 1 (New.)

200 TON NIAGARA



1—Niagara #612 D press. Straight side, double crank, back geared, 200 ton cap., 3" stroke, bed 60 x 38.

#98 NIAGARA



HEAVY PRODUCTION FOLDER

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) 3/16" to 1½", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

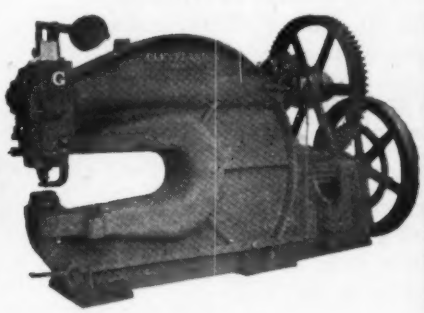
PLANERS

POND 72" x 72" x 18' table; 2 heads on rail, 2 side heads.
CINCINNATI 30" x 30" x 10' table, M.D.
PUTNAM 48" x 48" x 12' table, M.D.

PROFILERS

P. & W. No. 12 2-spindle motorized Profiler, Table 12" x 15" equip. with 6" rais. blocks, and 5 H.P., 3 ph. 60 cycle, 220 V. motor—Turner drive mounted and wired to push button control—rebuilt and guaranteed.

MODEL G CLEVELAND GAP PUNCH



Vertical Cleveland, model G open Gap Punch, 52" throat, arch Jaw, 2" hole thru 1" plate cap. arrange for Gear motor drive. 10 H.P., 3 ph., 60 cy., 220 v.

GEAR SHAPERS

2—#612 Fellows.

SHAPERS

26" Cincinnati Triple Geared Shaper, Friction Drive.
20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.

STRAIGHTENING MACHINE

No. 5-18½ Littell Single Rack & Pinion Feeding and Straightening Machine.

Presses, Brakes and Shears

MARIETTA Power Press Brake 104" between uprights. Dual rams to permit operations on separate dies from both sides of press. Bed area 20" x 104", each ram 6¼" x 98", 4" crank shaft, 3" stroke. Excellent condition.
Ohl power square Shear 8' 10 gauge.
Kutscheld all steel 36" x 16 ga. Foot Shear.
No. 132 Bliss 14 ga. 18" throat Slitter.
No. 222 Bliss 12 ga. 18" throat slitter.
No. 306 Bliss Straight Side, Tie Rod, 8" stroke, air cushion, motor drive, Press.
No. 65 N Bliss Straight Side, Tie Rod, Geared, 125 ton, 6" stroke, air cushion, motor drive, Press.
No. 3½C Bliss Toggle Press, Tie Rod, Vee belt motors.
No. 3½C Bliss Toggle Press, Solid Frame, Vee belt Motor Drive.
No. 3 A Bliss Toggle Press, 5½" shaft, Vee belt Motor Drive.
#20 Bliss O.B.I. 2½" stroke.

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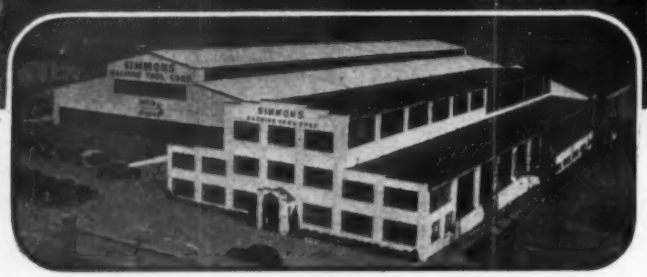

Where Engineered Rebuilding uncovers the unused working hours in machine tools

When does a machine tool reach the end of its productive life . . . ? In the America of Abundance this question raised little serious consideration. In the America of Abundance any machine tool, unless of the newest streamlined model, was called obsolete. The America of Abundance could wait for "The Machine Tool of Tomorrow."

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Awarded to the employees of the Simmons Machine Tool Corp., Aug. 20, 1942. Service Star awarded Feb. 13, 1943.

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76" BULLARD Vertical Boring Mill, 2 swivel heads, M.D.

No. 3 WARNER & SWASEY Universal Hollow Hex. Turret Lathe, 3 1/8" capacity, Belt or Motor Drive.

42" PUTNAM Double End Car Wheel Lathe, M.D.

47" N.B.P. Double End Car Wheel Lathe, M.D.

No. I L & A Multiple Punch, 100 tons, 72" between housings

6" x 6" x 5/8" Double Angle Shear.

Beam Shear 20", 60# and smaller.

60" Throat 8" x 1 1/16 Shear.

54" Throat 1 3/4" x 1 1/8" Punch.

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15" GLEASON Bevel Gear Generator.

30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.

36" Rotary Planer, M.D.

52" Rotary Planer, M.D.

48" x 48" x 24' NBP Heavy Planer, Two Rail, One Side Head, Motor Drive.

48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.

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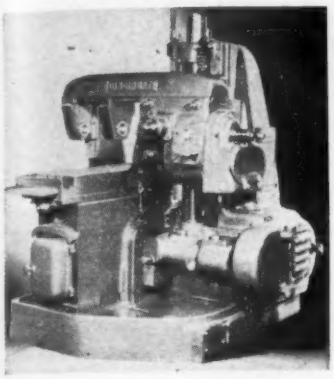
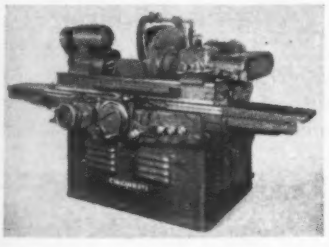


Cincinnati Plain Automatic

Cincinnati Plain Hydromatic



Cincinnati Plain Hydraulic

MILLING MACHINES

1 No. 1-18 Cincinnati Plain Automatic, m.d. in base, latest type, less than 1 year old

2 No. 2-18 Cincinnati Rise & Fall Automatic, m.d. in base, with backlash eliminator, automatic spindle stop. New in May, 1943

2 No. 2-24 Cincinnati Plain Automatic, m.d. in base, with blacklash eliminator, automatic spindle stop. New in October, 1942

1 No. 4-48" Cincinnati Plain Hydromatic, m.d. in base, one year old.

3-18" Cincinnati Mfg., m.d., latest type, 1 year old

1 No. 2 Cincinnati Plain Dial Type, m.d. in base

1 No. 4 Cincinnati Plain, rect. overarm, m.d.

1 No. 5 Cincinnati Plain, rect. overarm, National Standard Spindle, latest type

2 No. 2M Cincinnati Vertical, m.d. in base, with power feed rotary table, new in September, 1942

1 No. 3 Cincinnati High Speed Vertical Dial Type, m.d. in base

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10 x 36" Cincinnati Plain Hydraulic Grinding Machine, motor drive, with A.C. motors. Latest type machine, 1 year old

12 x 48" Cincinnati Plain Self-Contained Cylindrical Grinding Machine, motor drive, with motors

8 x 36" Cincinnati Saddle Type Grinder, motor drive, with motors

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12' American Triple Purpose Plain Radial Drill, arranged for direct current motor drive on arm, has 26" column diameter, latest type

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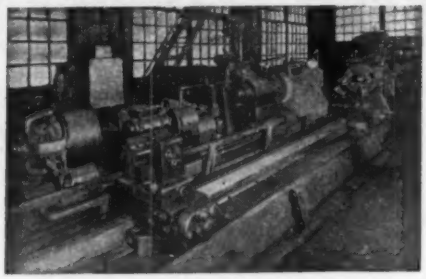
10', 60" Niles Vert., 2 heads
54", 62" Colburn, M.D., 2 heads
2½" G. & Lewis, M. D.
2½" Binsee
3½" Rochester, M. D.
4", 4½" Gisholt and Niles
36" Bausch, Niles, 2 heads
42" Bullard, 2 heads
36" Bullard VTL Turret

LATHES

48" x 26' Niles
48" x 14' B. & Emmes Q.C.
26" x 14' Rahn-Larmon, rais. blks. to 34", Q.C.
36" x 21' Wickes 3 step, Q.C.
30" x 20' LeBlond Std. chg.
24" x 12' LeBlond, M. D.
26" x 24' Putnam, S.Q.C.

AUTOMATICS

3—Potter & Johnston No. 6A Turret Lathes, M. D.
10—Gridley ¾"—4¼" sgl. and multiple spindles



50" x 28'

NORTON

ROLL GRINDER, M. D.

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Cincinnati No. 5 Plain, M. D.
B. & S. No. 33, M. D.
Milwaukee No. 3 Vert., S.P.D.
Cleveland No. 2 Univ., S.P.D.
Cincinnati No. 2, 3 Univ., M.D.

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P. & W. 14", M. D., B. B.
Norton 12 x 18", M. D.
Landis 14 x 52", S.P.D.
Modern 12 x 28" M.D.
B. & S. No. 10, 11, 14
Blanchard 26" Surface S.P.D.
Diamond 12 x 36", M. D.

TURRET LATHES

Gisholt 24", 6¼" hole
Gisholt 28", 3¼" hole
Gisholt 21", 3½", hole
Libby 18", S.P.D.
Bullard, King 36" VTL. Turret
King 34" VTL. Turret
W. & S. No. 3A, S.P.D.
Foster No. 1B, S.P.D.

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1—W-F 1000 ton press, 20" ram, 7" stroke
1—W-F High-Low Pump, 60 GPM at 300 #, WP., 3 GPM at 6500 High WP
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1—Triplex Pump 1 x 5, 1000 cu. in. 6000 # WP.

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#3—26" B & S Gear Cutter.
#6 Fellows Gear Shaper, Cullman M.D.
#645 Fellows Gear Shaper, Cullman M.D.

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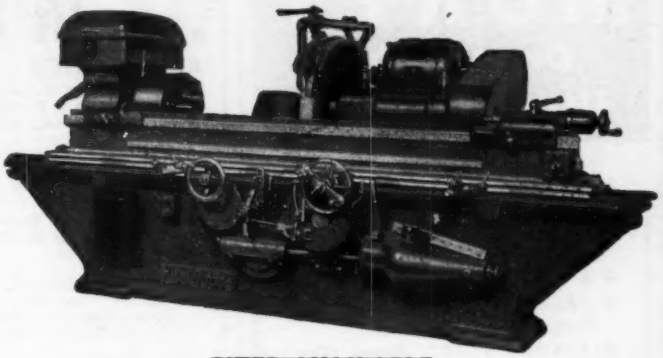

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Compressor, 1400 cu. ft. Sullivan WN3
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Drill, 20" Barnes A.G.S.O.
Drill, No. S 201 Barnes production
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Drill, Type 8H Natco horizontal
Drill, W. F. & J. Barnes vertical boring, reaming & drilling, hyd. feed
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Gear shaper, Z2 (No. 624) Fellows
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Grinder, No. 3 Cincinnati universal
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Lathe, 4" x 36" Lo Swing, hardened ways.
Lathe, 8" Sundstrand Stub
Lathe, 14" x 19" Fay automatic
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Miller, No. 4 Cincinnati
Miller, Type C Hall Planetary thread
Miller, No. 3 Turn Millers
Miller, Nos. 10 & 45 Productomatic
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Planer, 24" x 24" x 6' Woodward & Powell
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Presses, Nos. 180 & 796¼ D Toledo, toggle drawing
Presses, Nos. 201 & 203 General Flexible
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Shaper, 36" Morton draw-cut
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Lathe, Melling 6 cyl. crankshaft
Sand Mixer, Baker Perkins
Screw Driver, No. 61AA Bodine
Washer, Blakeslee metal
Wire machine, ⅝" x 3" Shuster
Threader, 1" Cleveland automatic double end
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Grinder, Cincinnati face milling cutter
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AUTOMATICS, Cleveland, ⅝" 4 spdle, cut-off, M.D.
AUTOMATICS, Potter & Johnston #5A & 6A
BORING MILLS, 42" Bullard, 2 Swivel Hds.
BORING MILLS, 42" Gisholt, 1 Turret & S.H.
GEAR HOBBERS, 12 Barber-Colman
GEAR SHAPERS, #7 High Speed, M.D.
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GRINDERS, Heald R. S. 12" Mag. Chuck
GRINDERS, Landis, #1 Universal
GRINDERS, Norton, 14x36" Plain, M.D.
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2½" Cleveland, Model A, single spindle

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XB10 Oilgear Hydraulic, Horizontal

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No. 17 Foote Burt, 2 spindle
Avey Sensitive, 3 spindle
Leland-Gifford, Sensitive, P.F., 3 spindle
Barnes Camelback, 4 spindle

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No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

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No. 70 Heald Internal

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18" x 8' Lodge & Shipley, c.d.
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36" Bullard New Era V.T.L., m.d.
42" Bullard New Era V.T.L., m.d.
No. 2 Acme Full Universal, q.h.
No. 2A Warner & Swasey, q.h.
18" Steinle, q.h.
No. 6A Potter & Johnston, q.h.

MILLS
3" Lucas Horizontal Boring, m.d.
No. 1½A Brown & Sharpe Universal, s.p.d.
No. 2 Cincinnati Plain, s.p.d.
No. 3 Ryerson-Conradson Plain, s.p.d.
No. 12 Brown & Sharpe, c.d.
Type A Briggs, c.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

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No. 8 Whiting Comb. Punch & Shear
No. 2 V & O Press, O.B.I.
No. P2 Ferracute Press
15 Ton Lucas Forcing Press, m.d.

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20" Stockbridge Crank Shaper, c.d.
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38" x 38" x 12' Niles Planer, m.d.

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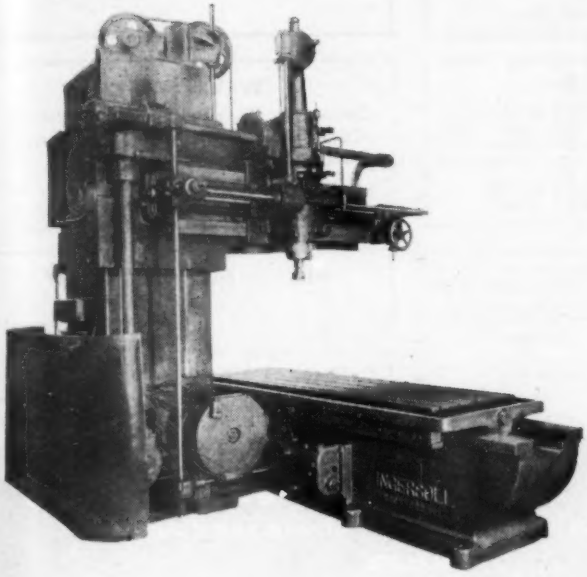

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